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TRANSACTIONS

OF THE

American Dental Association

BOSTON
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FOURTEENTH ANNUAL SESSION,

HELD AT DETROIT, MICH.

August 4th, 5th, 6th and 7th, 1874.

SPRINGFIELD, ILLS.
BEN. A. RICHARDS, PRINTER.
1875.

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PUBLICATION COMMITTEE:

C. STODDARD SMITH, L. D. SHEPARD, A. H. BROCKWAY.

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MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

By M. S. DEAN, Secretary.

THE American Dental Association commenced its Fourteenth Annual Session in St. Andrew's Hall, Detroit, Michigan, August 4th, 1874, at 10:45 A. M.; the President, Prof. T. L. Buckingham, in the chair.

The session was opened with prayer by the Rev. L. P. Mercer, of Detroit.

The roll of permanent members was called. The following members were reported as having paid their dues, those marked with an * not being present, but forwarding their dues.

W. W. Allport,	669 Wabash-ave., Chicago.
*Wm. H. Allen,	18 West 11th st., N. Y.
John Allen,	314 5th-ave., N. Y.
C. F. Allan,	Newburg, N. Y.
H. L. Ambler,	114 Euclid-ave., Cleveland, O.
*J. J. Anderson,	Springfield, Mass.
W. H. Atkinson,	41 East 9th st., N. Y.
J. M. Austin,	76 Felix st., St. Joseph, Mo.
C. M. Bailey,	Machias, Me.
*J. W. Baxter,	Vevay, Ind.
*C. H. Biddle,	133 Pacific st., Brooklyn, N. Y.
*J. J. Birge,	San Francisco, Cal.
*W. A. Bronson,	8 East 34th st., N. Y.

A. H. Brockway,	13 Greene-ave., Brooklyn, N. Y.
*Seneca B. Brown,	Ft. Wayne, Ind.
E. A. Bogue,	29 East 20th st., N. Y.
C. R. Butler,	114 Euclid-ave., Cleveland, O.
L. Buffett,	Cleveland, O.
T. L. Buckingham,	1206 Vine st., Philadelphia, Pa.
C. C. Carroll,	Meadville, Pa.
J. S. Cassidy,	Covington, Ky.
J. F. Canine,	170 5th st., Louisville, Ky.
M. L. Chaim,	30 Cooper Institute, N. Y.
*H. S. Chase,	1206 Washington-ave., St. Louis.
James Cleland,	Campus Martius, Detroit, Mich.
E. N. Clark,	Beloit, Wis.
*Aaron Colton,	Hudson, N. Y.
C. D. Cook,	133 Pacific st., Brooklyn, N. Y.
J. N. Crouse,	652 Wabash-ave., Chicago.
W. G. Cummings,	Sturgis, Mich.
Geo. H. Cushing,	174 State st., Chicago.
E. B. David,	Aledo, Ill.
G. C. Daboll,	Buffalc, N. Y.
M. S. Dean,	174 State st., Chicago.
I. Douglass,	Romeo, Mich.
R. B. Donaldson,	Washington, D. C.
B. Oscar Doyle,	291 W. Jefferson st., Louisville, Ky.
*Chas. E. Dunn,	148 2d st., Louisville, Ky.
W. C. Dyer,	1135 Wabash-ave., Chicago.
*Wm. Dutch,	26 Montgomery st., San Francisco,
Geo. E. Elliot,	Meadville, Pa.
C. D. Elliot,	Franklin, Pa.
Geo. L. Field,	Campus Martius, Detroit, Mich.
Isaiah Forbes,	8th st., near Olive, St. Louis.
*S. A. Freeman,	416 Main st., Buffalo, N. Y.
*A. W. Freeman,	675 Wabash-ave., Chicago.
E. S. Gaylord,	New Haven, Ct.
Wm. H. Goddard,	65 West Walnut st., Louisville, Ky.
A. J. Grosvenor,	Troy, O.
D. C. Hawxhurst,	Battle Creek, Mich.
*J. L. Hill,	Gettysburg, Pa.
E. S. Holmes,	Grand Rapids, Mich.
A. Holbrook,	Milwaukee, Wis.

WM. P. HORTON,	1 Euclid-ave., Cleveland, O.
*E. HONSINGER,	280 Park-ave., Chicago.
E. HUNTER,	Manchester, Mich.
P. G. C. HUNT,	Indianapolis, Ind.
*ROBERT HUEY,	330 S. 15th st., Philadelphia.
W. H. JACKSON,	Ann Arbor, Mich.
*J. K. JAMISON,	Connersville, Ind.
JAS. JOHNSTONE,	Staunton, Va.
HOMER JUDD,	819 Locust st., St. Louis.
GEO. W. KEELY,	Oxford, O.
G. W. KLUMP,	Williamsport, Pa.
*ISAAC KNAPP,	Fort Wayne, Ind.
JAS. S. KNAPP,	15 Baronne st., New Orleans.
*C. C. KNOWLES,	San Francisco, Cal.
*S. E. KNOWLES,	San Francisco, Cal.
W. O. KULP,	Davenport, Ia.
H. K. LATHROP, JR.	153 Woodward-ave., Detroit, Mich.
W. E. MAGILL,	Erie, Pa.
J. F. MARRINER,	Ottawa, Ill.
A. T. METCALF,	Kalamazoo, Mich.
W. H. MORGAN,	Nashville, Tenn.
S. H. MCCALL,	12 Henry st., Binghampton, N. Y.
B. R. MCGREGOR,	Rochester, N. Y.
*A. F. MCLAIN,	14 Baronne st., New Orleans,
*JAS. MCMANUS,	Hartford, Ct.
J. H. MCQUILLEN,	2100 Arch st., Phila.
*H. B. NOBLE,	Washington D. C.
L. G. NOEL,	Nashville, Tenn.
*A. L. NORTHROP,	44 W. 46th st., N. Y.
EDMUND OSMOND,	266 Vine st., Cincinnati, O.
CORYDON PALMER,	New York.
S. B. PALMER,	Syracuse, N. Y.
J. E. PHELPS,	Chagrin Falls, O.
*C. N. PEIRCE,	501 N. 7th st., Philadelphia.
*F. PEABODY,	91 W. Ches. cor. 3d, Louisville, Ky.
F. H. REHWINKEL,	Chillicothe, O.
F. J. RICHARDS,	Williamsport, Pa.
J. C. ROSS,	Nashville, Tenn.

*H. L. Sage,	Bridgeport, Ct.
*I. A. Salmon,	670 Temont st., Boston.
*J. N. Scranton,	Bennington, Vt.
L. D. Shepard,	Hotel Boylston, Boston.
C. Stoddard Smith,	418 Adams st., Springfield, Ill.
H. A. Smith,	286 Race st., Cincinnati
John S. Smith,	210 Locust st., Columbia, Pa.
B. T. Spellman,	231 Woodward-ave., Detroit, Mich.
S. S. Southworth,	Niagara Falls, N. Y.
C. S. Stockton,	15 Cedar st., Newark, N. J.
John Stephan,	85 Michigan st., Cleveland, O.
*E. D. Swain,	69 Washington st., Chicago.
J. S. Swartley,	749 Michigan-ave., Chicago.
J. A. Swasey,	944 Wabash-ave., Chicago.
J. Taft,	117 W. 4th st., Cincinnati.
C. R. Taft,	Mansfield, O.
G. R. Thomas,	Campus Martius, Detroit, Mich.
S. B. Tizzard,	Dayton, O.
Wm. Van Antwerp,	Mt. Sterling, Ky.
J. R. Walker,	Nap. ave., cor. Coliseum, N. Orleans.
E. J. Waye,	Sandusky, O.
J. H. Warner,	Columbus, O.
Geo. Watt,	Xenia, O.
*Geo. F. Waters,	8 Beacon st., Boston.
M. H. Webb,	Lancaster, Pa.
I. J. Wetherbee,	46 Dover st., Boston.
S. Welchens,	Lancaster, Pa.
*J. C. Whinery,	Salem, O.
E. M. Wolfe,	Oil City, Pa.
*C. F. Wheeler,	Albany, New York.

The minutes of the last annual session were called for, and on motion the reading was dispensed with.

The amendment to the Constitution proposed by Dr. Goddard at the last annual session was taken up and adopted, viz to amend Section 3, Article III, by substituting for that Section, the following:

Section 3. Members to be of three classes.—The members of this Association shall be of three classes, viz: delegates, permanent and honorary members; the two former having equal rights and privileges, except eligibility to office; none being eligible to hold office, except permanent

members; the latter class to consist of prominent worthy members of the dental profession residing in foreign countries, who shall be elected by ballot.

[This amendment will be found already incorporated in the last pamphlet edition (1873.) of the Constitution, on page 3, as well as in the Constitution printed with the Transactions for 1873.—*Sec.*]

On motion of Dr. Dean, the amendment to Article II, Section 3 of the Code of Ethics, proposed by the Publication Committee, was adopted, viz: to substitute for the Section mentioned, the following:

SECTION 3. It is unprofessional to resort to public advertisements, such as cards, handbills, posters or signs, calling attention to peculiar styles of work, prices for services, special modes of operating, or to claim superiority over neighboring practitioners; to publish reports of cases, or certificates in the public prints; to go from house to house soliciting or performing operations; to circulate or recommend nostrums, or to perform any other similar acts. But nothing in this section shall be so construed as to imply that it is unprofessional for dentists to announce in the public prints or by card, simply their names, occupation, and place of business; or in the same manner to announce their removal, absence from, or return to business; or to issue to their patients appointment cards having a fee-bill for professional services thereon.

[This amendment will be found on page 21 of the pamphlet Constitution of 1873—*Sec.*]

Adjourned to 2 o'clock P. M.

FIRST DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the President in the chair. The minutes of the morning session were read and approved.

Dr. Dean moved the re-adoption of the resolution rescinded at the last annual meeting, which is as follows:

Resolved, That henceforth no person shall be received as a delegate who is in arrears for dues, or until they have paid to the Treasurer the full amount due at the time their names were dropped for non-payment.

The question being upon Dr. Dean's motion, a discussion took place, participated in by Drs. Spellman, Goddard, Wetherbee, Atkinson, Thomas and Crouse, and the motion was carried.

Dr. Shepard, chairman of the Committee on Credentials, made a report which, as finally completed by various supplemental reports, was adopted as follows:

Iowa State Dental Society—W. O. Kulp.
Kentucky State Dental Association—W. H. Goddard, J. F. Canine, W. Van Antwerp, B. Oscar Doyle.
Lake Erie Dental Association—E. M. Wolfe.
Mad River Valley Dental Association of Ohio—A. J. Grosvenor, S. B. Tizzard, Geo. Watt.
Maine State Dental Society—C. M. Bailey.
Michigan Dental Association—E. S. Holmes, D. C. Hawxhurst, A. T. Metcalf.
Missouri State Dental Association—J. M. Austin.
New York Odontological Society—A. H. Brockway.
Second District Dental Society of New York—C. F. Allan.
Fifth District Dental Society of New York—S. B. Palmer.
Sixth District Dental Society of New York—S. H. McCall.
New Orleans Dental Associaton—J. S. Knapp.
New Jersey State Dental Society—C. S. Stockton.
Northern Ohio Dental Association—J. E. Phelps, John Stephan.
Ohio State Dental Society—J. H. Warner, W. P. Horton.
Odontograpic Society of Pennsylvania—M. H. Webb.
Pennsylvania State Dental Society—W. E. Magill, S. Welchens.
Tennessee Dental Association.—J. C. Ross, L. G. Noel.
Washington City Dental Society—R. B. Donaldson.
Wisconsin State Dental Society—E. N. Clark, A. Holbrook.
Boston Dental College—I. J. Wetherbee.
Dental School of Harvard University—L. D. Shepard.
Ohio Dental College—J. S. Cassidy, W. P. Horton.
Pennsylvania College of Dental Surgery—T. L. Buckingham.
Philadelphia Dental College—J. H. McQuillen.
Chicago Dental Society—J. A. Swasey, J. S. Swartley, M. S. Dean.
Dental Society of Detroit—H. K. Lathrop, Jr., Jas. Cleland.
Indiana State Dental Association—J. K. Jamison.
Illinois State Dental Society—Geo. H. Cushing, J. N. Crouse, W. C. Dyer, C. Stoddard Smith, E. B. David, J. F. Marriner.

The consideration of reports of Standing Committees was then taken up, and the first report in order, Dental Physiology, was read by the chairman, Dr. M. S. Dean.

Dr. McQuillen offered a transcript of the articles referred to in the report of Dr. Dean, as showing more fully the positions he

had taken therein, and on motion of Dr. Dean was invited to read the same; he accordingly read the paper, and discussed the report verbally.

The discussion was continued by Drs. Atkinson, Judd and Knapp.

By consent Dr. Crouse here introduced the subject of the testimonial fund to Dr. Barnum, and was followed by Drs. Keely, Goddard and others.

Adjourned until 7:30 P. M.

FIRST DAY—EVENING SESSION.

The association convened at 7:30 P. M., Pres. Buckingham in the chair. The minutes of the previous session were read and approved. The subject of Dental Physiology was continued, and discussed by Drs. Atkinson, Judd, Dean, Hunter, Knapp, Osmond, S. B. Palmer and McQuillen.

On motion the subject was passed.

The report on Dental Pathology was called for, and one written by Dr. H. S. Chase, a member of that committee, was read by Dr. Cushing.

The subject was then discussed by Drs. Atkinson, Judd, Bogue, Hunter, Butler, Morgan, Walker and Crouse.

Adjourned according to order of business.

SECOND DAY—MORNING SESSION.

The Association met pursuant to adjournment, the President in the chair. The minutes of the previous session were read and approved.

Dr. Shepard offered the following resolution, which was adopted:

Resolved, That the Treasurer is hereby instructed to notify permanent members who have not paid their annual dues, of their indebtedness, and inform them that if they owe for two years at the end of the present session, they are liable to be dropped from membership.

The subject of Dental Pathology and Surgery was continued, and discussed by Drs. Watt, Taft, Osmond, Morgan, Judd, Spellman, McQuillen, Atkinson, Dean and Bogue.

On motion the subject was passed.

The report on Histology was called for, and further time granted to the committee.

Dr. Bogue moved that a committee of three be appointed for the purpose of presenting appropriate memorial resolutions in regard to the decease of Professor Hitchcock. Carried, and Drs. Bogue, Taft and Shepard appointed.

The report on Dental Chemistry was called for, and read by Dr. H. A. Smith, chairman of that committee.

Dr. Shepard gave notice of the following amendment to the constitution, viz:

Add to article IV, the clause, "The Executive Committee shall have power to change the place determined upon for the regular meeting, for extraordinary reasons, notice of such change to be published in due season."

Adjourned until 7:30 P. M.

SECOND DAY—EVENING SESSION.

The Association convened at 8 o'clock, Vice-President Forbes in the chair. The minutes of the previous meeting were read and approved. The discussion of the report on Dental Chemistry was declared in order, but on motion was passed.

The Report on Histology was called for, and further time granted the committee.

Dr. Taft moved that, as there were no members of the Committee on Dental Therapeutics present, the Chair appoint some

member to open the subject for discussion, at the proper time. Carried, and the Chair appointed Dr. Taft in accordance with the resolution.

On motion of Dr. Atkinson, the committee on Etiology was called, and Dr. Webb, a member of that committee read a report.

On motion the further consideration of the subject was postponed until the chairman of that committee should be prepared to present his report.

The Committee on Operative Dentistry was called, and the chairman, Dr. Shepard, read a report; after which the subject was discussed by Drs. Crouse, Wetherbee and Thomas.

Adjourned.

THIRD DAY—MORNING SESSION.

The Association met pursuant to adjournment, at 10 A. M., the President in the chair. The minutes of the preceding meeting were read, corrected and approved.

Miscellaneous business was called up, and Dr. Rehwinkel, chairman of the committee appointed last year, to endeavor to secure the appointment of Dental Surgeons in the army and navy, reported that for various reasons, one of which was the tendency of Congress towards retrenchment, the committee deemed it advisable to make no attempt at present to accomplish anything in that direction; and on motion of Dr. Crouse, the report was received and adopted, and the committee discharged.

The subject of Operative Dentistry was continued, and discussed by Drs. Cushing, Butler, Knapp, Allen, Keely, Kulp, Stockton, Osmond, Bogue, Judd, McQuillen and Allport.

On motion the time of adjournment was extended fifteen minutes beyond the usual time.

Dr. Bogue, chairman of the Committee to draft Memorial Resolutions relative to the death of Dr. Hitchcock, reported the following, which was unanimously adopted:

Whereas, This Association has with sorrow learned of the death of Prof. Thos. B. Hitchcock, of the Harvard Dental School, one of our most valued members, and the chairman for this year of the committee on Histology and Microscopy; therefore

Resolved, That we signify in this public manner our sense of the great loss which the profession and the cause of Dental Education has sustained; and that this resolution be inserted in the records in the place where the report of the Committee would have appeared.

E. A. BOGUE,
J. TAFT,
L. D. SHEPARD. } *Committe.*

On motion the selection of the place of next meeting, and the election of officers, was made the special order for the evening session.

Adjourned until 2:30 P. M.

THIRD DAY—AFTERNOON SESSION.

The Association convened at the appointed hour, the President in the chair. The minutes of the preceding session were read and approved.

The subject of operative dentistry was continued, and discussed by Drs. S. B. Palmer, Walker, Knapp, Atkinson, Shepard, Webb, and Taft; and on motion the subject was passed.

A motion to reconsider this vote was carried, and the original motion was renewed and lost. The subject was again taken up and discussed by Drs. Taft, Thomas, and Rehwinkel; and on motion the subject was passed.

The Committee on Dental Appliances made a report, through its chairman, Dr. Field, which was accepted, and referred to the Publication Committee.

On motion, the subject of Etiology was resumed, and a report read by Dr. McQuillen. Discussed by Drs. McQuillen and Noel.

Adjourned till 7:30 P. M.

THIRD DAY—EVENING SESSION.

The Association convened at 8 o'clock, President Buckingham in the chair. The minutes of the preceding session were read and approved.

The special order of the evening, viz: selection of place of next meeting, and election of officers, was taken up and proceeded with.

Dr. Cushing, from the committee to nominate a place for next meeting, reported that the committee nominated only Niagara. The ballot being taken, Niagara was selected.

The election of officers was then proceeded with, and resulted as follows:

President—M. S. DEAN, Chicago.
First Vice President—G. W. KEELY, Oxford, Ohio.
Second Vice President—J. S. KNAPP, New Orleans.
Corresponding Secretary—G. L. FIELD, Detroit.
Recording Secretary—C. STODDARD SMITH, Springfield, Illinois.
Treasurer—W. H. GODDARD, Louisville, Kentucky.
Executive Committee—(New members) A. H. BROCKWAY, Brooklyn; G. C. DABOLL, Buffalo; S. B. PALMER, Syracuse.

On motion, the order of business was suspended, to enable Dr. Cushing to offer the following amendments to the Constitution, which were lost for want of a unanimous vote, and were laid over until next year, viz:

To amend Art. V, Sec. 6,—under head of "Sub-committees—First Division, Committee of Arrangements,"—by striking out these words—"if practicable, reside at or near the place at which the Association is to hold its next annual meeting, and shall"—

To amend Art. IV, by adding this clause;—"After the selection of a place of meeting there shall be appointed by the President annually, a committee of three, residing at or near the place selected for the next meeting, whose duty it shall be to procure rooms for meetings, clinics and for the exhibition of mechanical appliances, and to make such other local arrangements as may be needed for the Association. This committee shall act under the direction of the first division of the Executive Committee."

Adjourned.

FOURTH DAY—MORNING SESSION,

The Association met pursuant to adjournment, President Buckingham in the chair; the minutes of the previous meeting were read and approved.

On motion of Dr. Judd, the subject of Etiology was passed.

The Treasurer made his report, as follows, which was accepted and adopted.

WM. H. GODDARD, TREASURER, IN ACCOUNT WITH AMERICAN DENTAL ASSOCIATION.

Dr. August, 5th 1873.

To Balance, in my hands		$320 13
Cash, dues, for 1872	$ 25 00	
" " " 1873	580 00	
		605 00
		$925 13

Cr. August 4th, 1873.

By paid Voucher No. 1	$100 00	
" " No. 2	50 00	
" " No. 3	50 00	
" " No. 4	11 90	
" " No. 5	500 00	
		711 90
August, 1874, To Balance,		213 23
		$925 13

WM. H. GODDARD, *Treasurer.*

We have examined the Report of the Treasurer, and find it correct.

L. D. SHEPARD, }
S. B. PALMER, } *Committee.*

DETROIT, MICH., *August 6th, 1874.*

The Committee on Volunteer Essays recommended the reading of a paper handed in by Dr. I. Douglass of Michigan, upon apparent death by chloroform, and it was accordingly read by Dr. Cushing, and referred to the Publication Committee.

On motion of Dr. Shepard, the salaries of the Secretary and Treasurer were ordered paid.

Dr. Shepard, was on motion allowed to withdraw a resolution that he had previously offered, but which had not been stated by the chair and which at his request had been laid on the table for the time, and to substitute for the same the following, which was unanimously passed.

Resolved, That the American Dental Association fully appreciates the promptness with which Dr. S. S. White responded to the requests of the dental profession, to take the management of the suit for the ascertainment of the rights of the public in regard to the use of Vulcanite for dental purposes; and would respectfully request him to continue his valuable aid in carrying up the case for final adjudication by the Supreme Court of the U. S., pledging him our moral and material support in defraying the expenses which may be incurred in the future.

The Subject of Dental Education was taken up, and the reports of the Standing Committee and Essays on that subject were ordered read before it was discussed.

A letter was received from Prof. McLain, of New Orleans, the chairman of the Committee, expressing regrets at his inability to be present, and wishing the association a pleasant and profitable session. The letter being accompanied by Prof. McLain's Report as chairman of the Committee, was read by Prof. Knapp. Dr. Keely, a member of the Committee, followed with an additional report.

The subject was then discussed by Drs. Allen, Walker, Taft and Thomas.

On motion of Dr. Shepard, it was resolved that the time of speakers on this subject be limited to ten minutes.

The subject was further discussed by Drs. Stockton, Bogue, Butler, Shepard, Allport, Morgan, Wetherbee, McQuillen, Crouse, Atkinson, Osmond, Watt, and Rehwinkel.

Dr. Butler offered the following resolution, which was adopted:

Resolved, That it is the opinion of the American Dental Association,

that the time has fully come, when degrees should not be conferred by Dental Colleges upon any student who has attended but one course of lectures.

The vote was afterwards reconsidered and the resolution laid over until next year.

Adjourned.

FOURTH DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the President in the chair. The minutes were read and approved.

The bill of the Committee of Arrangements was read and adopted and ordered paid.

Dr. Stockton offered the following amendment to the Constitution; viz, to amend Article V, Section 1, as follows: in lieu of the second clause, substitute the following:

The three names having the greatest number of votes, shall be the sole nominees for President, and first and second Vice-President, and upon the next ballot these three names only, shall be voted upon; the name receiving the highest number of votes shall be declared President; and the name receiving the next highest, shall be the first Vice-President; and that receiving the next highest, shall be the second Vice-President.

Laid over one year according to rule.

Dr. Shepard offered the following, which was adopted:

Resolved, That the thanks of this Association be tendered to the Reporters of the press; to the proprietors of the hotels; to the local Committee of the Association, to whose efforts and labors has been due in a large degree, the success and pleasure of the present meeting; to the city authorities of Detroit, for the free use of the Council Chamber; and to the Dentists of Detroit, for the very generous and hospitable manner in which they have received and entertained the Association.

Dr. Judd moved a resolution, directing that the volumes of transactions of previous years, now on hand, excepting those of last session, be donated to such individuals as might call for them; and on motion of Dr. Thomas that motion was so amended that

the balance remaining, should be donated to the local societies of the country; the recipients to pay costs of transportation. The resolution and amendment were both carried.

The Nominating Committee reported the following as the Standing Committees for the ensuing year, which upon vote were duly elected;

Physiology—J. H. McQuillen, E. S. Gaylord, J. R. Walker
Pathology—H. Judd, L. D. Shepard, J. S. Knapp.
Histology and Microscopy—J. Taft, E. D. Swain, W. H. Jackson.
Chemistry—H. A. Smith, S. B. Palmer, J. S. Cassidy.
Therapeutics—E. A. Bogue, W. O. Kulp, C. C. Carroll.
Operative Dentistry—G. H. Cushing, C. S. Stockton, S. H. McCall.
Mechanical Dentistry—F. H. Rehwinkel, J. F. Canine, J. Johnstone.
Dental Education—G. W. Keely, A. H. Brockway, S. Welchens.
Dental Literature—I. Knapp, L. G. Noel, C. D. Cook.
Etiology—H. S. Chase, D. C. Hawxhurst, C. S. Smith.
Prize Essays—I. Forbes, G. L. Field, R. B. Donaldson.

The regular order of business was resumed, and the subject of Dental Education was further discussed by Drs. Rehwinkel, Horton, and Judd.

Dr. Bogue offered the following resolutions:

Resolved, That it is the sense of this Association that no dental student should be graduated from any dental college without at least three years instruction, including private pupilage and college instruction; the latter should in no case embrace less than two full regular courses.

Resolved, That this Association suggest to the different Colleges of this country to appoint a common Examining Committee, consisting of five members, three to be a quorum, none of whom shall be in connection with any dental college, whose duty it shall be to examine all applicants for graduation, and decide upon the same.

Dr. Judd offered the following:

Resolved, That this Association recommends to all local societies, the adoption of rules prohibiting their members from taking students for a less period than three years, or for such time as will complete a three years pupilage.

These resolutions were by vote laid over until the next annual meeting.

Dr. Spellman moved that the committee to co-operate with Dr. S. S. White in defending the rights of the profession against the Vulcanite Company be called on for a report; and Dr. Judd the chairman, made a brief verbal report, which upon motion was received, and the committee continued, and the thanks of the Association tendered to them for the manner in which they have discharged their duties.

Dr. Knapp offered the following;

Resolved, That the thanks of this Association are due, and are hereby tendered to the Michigan State Dental Protective Union, for the energetic and so far successful manner in which its officers have resisted the claims of Josiah Bacon, and the Goodyear Dental Vulcanite Company.

After discussion by Drs. Spellman, Horton, Morgan, Wetherbee and Shepard, the resolution was adopted.

Dr. Allport offered the following amendment to the Constitution:

Amend Section 4, Article III, by adding the following:

This Association will hereafter receive no delegate who shall after this date, enter the profession without first having graduated at some reputable dental or medical college.

Laid over one year according to rule.

The Publication Committee made the following report which was accepted and adopted:

Five hundred copies of the Transactions of the American Dental Association, for the years 1871 and 1872 were published in one volume, two hundred and thirty-five of which were bound in muslin, the balance in paper, for..... $639.48

Note-Circulars, Envelopes and Pasters,.....	$ 9.00	
Postage, Expressage, &c.,.....	60.48	
		69.48
Total for years 71-2,.....		$708.96

Cr.

By Cash from Treasurer,.....	$650.00	
" Transactions sold by Publication Committee,.....	64.00	
		714.00
Balance due Association,.....		$5.04

M. S. DEAN, *Chairman of Pub. Com.*

The Publication Committee also made the following report:

Five hundred copies of the Transactions of the American Dental Association for the year 1873 have been published, about two hundred and twenty-five of which were bound in muslin, the balance in paper. Five hundred copies of the Amended Constitution were also published.

The total amount, as per bills, for publishing Transactions, Constitution, Histological Illustrations, and other printed matter.....		$740.12
Postage,.....	$31.90	
Expressage,.....	2.00	
		33.90
		$774.02

Cr.

By Treasurer,.....	$500.00	
" Balance last year,.....	5.04	
" Transactions sold by Publication Committee, ...	55.00	
		560.04
Balance due Publication Committee,.....		$213.98

M. S. DEAN, *Chairman Pub. Com.*

The report was accepted, adopted and the bill ordered paid.

On motion of Dr. Allport, the Publication Committee was instructed to print not exceeding two hnndred and fifty copies of Transactions, to be bound in paper covers.

Dr. S. B. Palmer, chairman of the committee appointed to prepare a popular circular on the care of the teeth, reported that the matter had been collected and embodied, but was not deemed sufficiently matured at the present time; the committee therefore asked further time, which was granted.

Dr. Keely, chairman of the Committee on the Barnum Testimonial Fund, reported progress, and asked further time, for the reason that many subscriptions had not been paid, and many societies had not been directly appealed to.

On motion the report was accepted and adopted, and the committee continued.

On motion to install the newly elected officers, Drs. Morgan and Allport were appointed a committee to induct them into office, and they were accordingly installed.

The report of the Committee on Mechanical Dentistry, written by Dr. E. D. Swain, was then read by Dr. Dean.

Dr. McQuillen offered the following amendment to the Constitution, viz:

Amend Art. VII so as to read, "twenty-four members shall constitute a quorum for the transaction of business in this Association.

Laid over one year under the rule.

The subjects of Therapeutics, Histology and Literature were passed, as well as the report of the Committee on Local Societies.

On motion of Dr. Cushing it was

Resolved, That the Treasurer be instructed to pay the usual orders for current expenses, and the drafts of the Publication Committee, when required.

The President appointed as members of the Publication Committee, Drs. A. H. Brockway, Brooklyn, and L. D. Shepard of Boston.

The Association then adjourned, to meet at Niagara Falls on the first Tuesday, (3d) of August, 1875.

REPORTS

OF

STANDING COMMITTEES,

VOLUNTEER ESSAYS,

AND

DISCUSSIONS.

REPORT OF THE COMMITTEE

ON

DENTAL PHYSIOLOGY.

By M. S. DEAN, Chairman.

SINCE presenting a report on Dental Physiology at the last session of this Association, nothing of importance, that is new, has come to the notice of the writer. For this reason, your committee must take a step backwards in order to find materials for the present report.

At the last session I gave a brief synopsis of a paper written by Prof. H. S. Chase, which had been published in the "Missouri Dental Journal," upon the absorption of the deciduous teeth. My attention has lately been called to a series of articles upon the same subject which were published in the "Dental Cosmos," in the year 1860, by Prof. McQuillen, in which similar views were set forth in regard to some of the phenomena attending the process of absorption of the deciduous teeth.

The articles referred to may be found commencing on pages 517—563 of Vol. I.

As the views therein expressed are, in many respects, very plausible ones, and have been maintained by the writer with uncommon ability; and, as I am informed are held and taught by the author at the present time, it does not seem inappropriate to lay them before this Association at this late day—and more especially so, as the subject of the absorption of the deciduous teeth, has never, that I am aware of, been discussed at any meeting of

this Association. I shall not, however, give a synopsis of these articles, but refer as briefly as possible to a few points in the author's theory of the absorption of these tissues.

He considers the wasting away of the roots of these teeth to be due to the *lessening* of the supply of nutritive materials to these tissues—"inducing atrophy"—or "retrograde metamorphosis," and not to the work of an absorbent organ. To use his own language: he says—"The necessity of an acrid substance or carneous body to effect the disintegration and removal even of the hard substances such as the osseous and dental tissues is not demanded; molecular disintegration fully accounts for it. The component cells having lived their appointed time, they degenerate, and their contents, assuming a fluid condition, are taken up by the veins or lymphatic radicals, neither of which can be looked upon as being capable of breaking down any tissue; for the vessels distributed to a part, be they arteries, veins or lymphatics are but the conduits or carriers of nutrient fluids to, and waste materials from the tissues."

In his closing remarks he says:—"Lastly, the fact must not be lost sight of, that the dental tissues are but a *congeries* of *cells* constituting an animal matrix, in which the calcareous salts are deposited; that these cells have a definite period of existence, and that by molecular disintegration they degenerate and are cast off. As the animal matrix degenerates cell by cell, their calcareous contents are liberated and become mixed with the fluids to be taken up by the venous or lymphatic radicals. If, in addition to this waste there is no supply of new material, *atrophy* is the result, and thus the roots of the deciduous teeth disappear."

The *immediate* causes which *reduce* the nutritive supply to the temporary teeth, the author explains in this wise: "At the time when the absorptive process begins, a new life springs up in the permanent germ which has for some time remained in a state of dormant vitality; it draws from the blood materials inservient to its *development* and *growth*, and in so doing removes from the current flowing to it and the deciduous tooth, the constituents necessary to *repair* the *waste* that takes place in the latter."

"In support of this position" he refers to the experiments of

Chossat, in producing artificial atrophy of the bones of animals by depriving their food of all calcareous elements.

The sympathetic nerve, he believes, also has an influence upon these processes; "Branches of this nerve are distributed alike to the pulp of the deciduous, and the papillæ of the permanent tooth, and" he says, "there can be but little question that the *development* of the one and the *absorption* of the other, is more or less dependent upon this nervous connection."

Besides these physiological causes, he holds that there is a physical one that plays an important part by diminishing the volume of the vessels of supply to the temporary teeth. On this point he says: "In addition to drawing to itself all or most of the nutrient materials from the neighboring current, as the permanent papilla increases in size, and the crown is formed, it makes a graduated pressure, first upon the capillary vessels of the osseous partition and then on those of the deciduous tooth; thereby arresting or diminishing the flow of blood distributed to those tissues. By these two causes not only the *quality* but the *quantity* of blood sent to the deciduous tooth is modified, and absorption favored."

I have quoted the explanation of the remote causes, which, according to his theory induce atrophy in the deciduous teeth, tolerably fully; not however with a view of controverting them, although they are not conclusive to my mind—but simply because I deem it due to a fair representation of this author's views upon that subject. I shall however, endeavor to examine what might be called, according to his theory, the more *immediate* cause of the absorption of these teeth—atrophy—somewhat carefully.

This view of the mode of absorption of the deciduous teeth, has been maintained by the author in an able and scholarly manner, by analogical reasoning; yet, in my mind there still remain objections to that writer's theory which I cannot reconcile with what I believe to be established facts.

Now if "*supply*" and "*waste*" of materials are constantly going on in the *dentine*, through what *channels* are these supplies conveyed *to* the dentine, and the waste carried *from* it?

The answer must be—through the vessels that enter and depart through the apicial foramen. If, then, atrophy results, in the *dentine*, from a deficient supply of nutrient matter, this sup-

ply must have been cut off from these vessels that *enter* the foramen, and the atrophy that ensues must occur in *those parts* which are deprived of their supply from these vessels—namely the dentine of the tooth.

The "waste" must be carried off by the vessels that make their *exit* from the foramen, and, if the waste of the dentine is increased, this *excess* of material must also be removed through the same channel.

Absorption of the *dentine* then, according to this view would commence in the internal structure of the root, and the "waste" would be as equally distributed when in *excess* of the "supply," as when the two processes were evenly balanced.

It seems to me that this process, or mode, is the one we might expect to occur, if the *scanty supply* of new materials to the root, is the cause of the disappearance of the deciduous tooth —in other words is the cause of the absorption of the dental tissues.

But the phenomena that we observe in the absorption of the deciduous teeth are of a totally different nature. Absorption *commences* and *continues* externally. The part that is absorbed is that, and that only, which lies in immediate contact with an absorbent papilla; while the portions lying away from it retain their integrity for months and even for years.

If we admit that pressure upon the root membrane may cause atrophy of that portion of the cementum immediately underlying it, it cannot be claimed that the external portion of the *dentine* of the root, that is first removed—at whatever point this may chance to occur—has been deprived of *its* supply of nutrient matter by this pressure any more than is any other portion of the dentine. As Dr. McQuillen has justly observed in a more recent article in the Cosmos (Vol. 6 page 123) we do sometimes find the roots of the teeth of aged persons, which have undoubtedly been lessened in size by absorption; but may we not account for this loss of substance from the exterior portion of the tooth, on a more rational hypothesis than to attribute it to atrophy—a wasting away of a part from defective nutrition?

In these cases where the roots of the permanent teeth have become diminished in size, Prof. McQuillen says—and says truly —that "the pulp cavities are very small or entirely obliterated."

This being the case could there have been any deficiency in the supply of materials to the dentine? Assuredly not, as the formation of new dentine shows that there is an excess rather than a deficiency in the material supply to this part.

Now in the light of these facts would it not be reasonable to conclude that this wasting away of the external portion of the root was due to the abnormal action of the root membrane, which, from irritation had increased in vascularity; that the substance of the root had been removed by an unhealthy activity of the vascular parts, differing entirely from that physiological process by which the deciduous teeth are removed?

Then again if the absorption of the deciduous teeth is the result of deficiency of nutrition, why are not the pulpless milk teeth removed more rapidly than are those which have living pulps? In the former the supply to the dentine is mostly cut off—I contend *entirely*—and the "waste" should increase in proportion as the "supply" is diminished—if the loss of substance is due to atrophy. But the facts are, we find the roots of the pulpless deciduous teeth are even more slowly absorbed than are the roots of the living ones. These facts, and I believe they are facts, are antagonistic to the theory that the loss of the roots of these teeth is due to *atrophy*.

I may misapprehend the meaning of Prof. McQuillen but from his language it would seem that he considers that the cells from which the dentine is formed, still retain their individuality. This is certainly Prof. Chase's view, and is held by many others. It seems to me that the perfectly matured dentine is not made up of cells, but made *out of* cells. To use the language of Prof. McQuillen, the cells are "*converted*" into dentine. According to Tomes, Boll, Beal, Waldeyer and many others the dentine is the *direct product* of the *conversion* of the odontoblasts. In Stricker's Histology, Waldeyer says—"It appears that the dentine with all its constituents proceeds from odontoblasts that have become metamorphosed in their *form* and *chemical constituents*." If this be true the dentine does not consist of individual cells—or of cells at all—but of the *product* of cells.

In the articles under consideration the author holds that the cells of the dentine have a definite period of existence. It would seem to me that their period of existence depends entirely

upon circumstances. The fully matured dentine is not disintegrated in the mouth unless surrounded by morbidly active vascular tissues, or from chemical or mechanical means, even if the supply of nutritive materials is entirely cut off. This is substantiated by common observation.

To see a tooth, which had lost its dental pulp a quarter of a century ago, the canal of the root having been perfectly filled, and the surrounding tissues remaining in a comparatively healthy condition—to see this tooth without perceptible change of texure after the nutritive supply to the dentine had been withdrawn for a period of twenty-five years—is what may be so commonly observed by the dental practitioner that it ceases to create astonishment. The period of duration of the dentine seems to depend entirely upon surrounding conditions and these conditions are extremely variable.

I am very naturally led here to say a few words in regard to the vitality of the dentine of pulpless teeth. I very often hear such dentine spoken of, as possessing a certain amount of vitality, —some claiming even, that they have found it, in rare cases, sensitive to the touch of an instrument.

If this dentine be living, whence is its nutritive supply derived? Can dentine receive nutriment from any other source than the germinal matter of dentinal cells? It is claimed that it receives its supply from the same source that nourishes the cementum. Can the cementum receive nourishment from the plasma of the blood, before it has been submitted to the transforming influence of the osteoblasts, converting it into germinal matter? Can any tissue receive nutrition *directly* from any other source than from the same kind of cells from which they are composed?

I think all these questions will be answered in the negative. If so, where do we find the odontoblasts that can convert the plasma of the blood into pabulum for the pulpless dentine.

I wish it distinctly understood that the above remarks are not made with a view of controverting any position taken by Prof. McQuillen, for in the articles under review, written fourteen years ago, he annunciates substantially I think the same general idea, in the following words:—"Nutrition however, does not consist merely in the component particles of the organs attracting

the fibrin, albumen and other materials of the blood which flows through them, but the assimilating particles through *cell agency*, must infuse into those newly added to them *their own vital properties*."

The general principle in regard to the function of the cells in nutrition, which I have endeavored to turn to account in proof of the non-vitality of pulpless dentine, was derived from the writings of Lionel S. Beale, who says: "I have endeavored to show, not that the germinal matter acts upon matter which passes by it, and so changes it, without undergoing change itself, but that every kind of formed material and tissue passes through the condition of germinal matter, and therefore in the formation of fibrous tissue, cartilage, &c., pabulum of the blood is taken up by the germinal matter, becomes germinal matter, and in turn is gradually resolved into the matrix or inter-cellular substance."

I had not at the outset of my remarks on the absorptive process, intended to bring to your notice any other than the theory set forth in these articles of Prof. McQuillen; but, for the sake of opening the subject more fully for discussion, rather than with the view of offering anything that will be new to the Association, I will briefly call to your minds some facts in connection with the generally accepted theory in regard to the *immediate* agents that affect the removal of the deciduous teeth.

The majority of the most eminent Physiologists agree unanimously in this: That these teeth are removed by the direct agency of an absorbent papilla. Some difference of opinion exists among them, however, as to the *origin* of this absorbent organ and its *mode* of operation—but all agree that it is the work of an absorbent agent lying external to the root.

As Tomes' views comprehend essentially the opinions of this larger class of Histologists, I will quote a few lines upon this point as an exponent of their general views, from his excellent work—"A System of Dental Surgery."

On page 73 he says:—"It has already been stated that the surface of the papilla is closely applied to the wasting surface of the tooth; and in favorable specimens it may be shown that the individual indentations correspond to, and are occupied by these *large cells*. On several occasions I have obtained specimens in which the two retained their natural positions. Each semicircular

indentation in the dentine was occupied by a *compound cell.* In another place (page 83) he says: "The precise nature of the action by which the cells *eat away* the hard tooth substance still remains a matter of great uncertainty." [The italics are my own.]

In Striker's Histology, Waldeyer, without expressing any opinion of his own, quotes Kehrer as believing "that the amœboid cells of the granulations destroy the dental tissues by their mining process, effected by their pseudopodia," (long finger like processes.)

Kölliker, in some recent remarks (2d March, 1872) which were published in the Missouri Dental Journal, translated from the Virteljahrschrift by Dr. Judd, attributes the removal of the deciduous roots to "giant cells." He says: (1) "When the bones and teeth in the normal course of development take on a resorption process, they invariably present a finely pitted external surface, which pits are commonly designated as the lacunæ of Howship. (2) The lacunæ mentioned, are occupied by *giant cells* in such a way that in every pit there is one giant cell. However, under certain circumstances also, single giant cells fill two pits, or, larger pits several myeloplaxes (giant cells.) (3) These giant cells do not originate by a metamorphosis of the cells of the dissolving hard formations, but by transformation of the formation cells of the osseous tissues (the osteoblasts,) and are organs which dissolve the osseous and dental tissues; hence they are designated by the name of ostoklasts (bone breakers) or ostophogen (bone eaters.)

"The giant cells"—he continues—"play a part in the teeth at the time of their shedding; the milk teeth are eroded upon their under side into furrows and pits by a connected layer of such cells in such manner as the bones, whereby in like manner genuine very regular Howshipian lacunæ make their appearance."

He describes these absorbent cells thus: "The ostoklasts show sometimes upon their sides which are turned towards the bone, a mass of fine hairs or threads, standing closely together, which similate as much as possible movable cellular processes penetrating the hard tissues."

These are the more recent expressions of Kölliker, and are the prevailing views of physiologists and histologists of today—

all agreeing that the work of absorption is performed by an absorbent organ lying externally to the root, but not in perfect accord as to the precise nature by which the cells accomplish this work.

Tomes expresses these general views more clearly and intelligibly than any other author whose writings I have read, and if not the highest is as high authority as we have on this subject.

In conclusion—It is of little consequence to us by what name the cells that perform this work are designated by different histologists:—they may be termed the myeloplaxes, ostoklasts, or ostophogen—giant cells, bone breakers, or bone eaters, with their hairy like filaments that tear away the dental tissues; or they may be called very large cells, compound or multiform cells—or which sounds a little more learned, we may call them *amæboid* cells which, by their pseudopodia, perform the same work in a similar manner;—it is of little consequence, I say, which of the various names these cells bear that remove the tissues of the deciduous teeth, provided we are enabled to comprehend the general functions of these cells.

DISCUSSIONS.

PROF. MCQUILLEN: In the presentation of the report of the committee on Physiology, Dr. Dean has, as he states, made extracts from a paper published by me, some fourteen years ago.

In doing this I am perfectly satisfied that it was his intention, not only in those extracts, but in the comments made in connection with them, to fairly present my views upon this subject. That the members, however, may properly understand my meaning, it is necessary that the connecting links between those extracts should be submitted to them. At the time when that paper was written, my aim was to make an application of the general law recognized by physiologists as governing nutrition in other organs and tissues, to the teeth, and that the changes taking place in them were in accordance with, and governed by,

that law. Familiar with and accepting some of the modifications in the views advanced since that by physiologists in relation to the histogeny of cells, I have as yet seen nothing to induce me to modify my views in relation to the absorption of the roots of the deciduous teeth, and therefore, if agreeable to the Society, I ask that the paper be read at this time.

[On motion of Dr. Dean, it was unanimously resolved that the paper should be read.]

ABSORPTION OF THE ROOTS

OF THE

DECIDUOUS TEETH.

By J. H. McQUILLEN.

[From the Dental Cosmos—Vol. I, p. 517—1860.]

IN the varied changes that occur during the successive periods of life in the different organs of the body, none are more remarkable than those presented in the development, growth, eruption, subsequent absorption of the fangs and exuviation of the crowns of the deciduous teeth. Subserving for a brief season important purposes of the economy, and then giving place to more durable organs, their strange eventful history presents phenomena of the most singular and instructive character.

The object of this communication however, is not to enter into a *minute* consideration of the successive changes that these teeth undergo in passing from the rudimental state to the perfected condition, but rather to take them at that point, and endeavor to account for the retrograde metamorphosis by which the perfectly consolidated dental tissues are removed.

Prior to advancing the views entertained by the writer, of the cause of this removal, it may not be amiss to direct attention to the existing dental literature on this subject.

From the earliest period down to the present, this phenomenon has attracted attention, and various theories, more or less varied in their character, have been advanced from time to time in explanation of the process. Thus many of the ancients supposed that the milk teeth had no roots. Others conjectured that the crowns of the milk teeth separated from their roots, just as the

horns of the stag fall from the head that bore them, and that the root then gave birth to a new tooth. "Fauchard and Bourdet attributed their removal to the action of a corrosive fluid. Bumon thought they were worn away by the rising tooth. Lecluse was of the opinion that when the process of their removal begins, their vessels cease to supply nourshing juices, and that they are broken up by a species of *maceration*, while Jordan believed it was both by abrasion and corrosion. Laforge, observing a fungiform or carneous substance behind the root of a temporary tooth, (which had in fact been noticed by Bourdet, and supposed by him to exhale a fluid possessed of solvent qualities,) gave it the name of absorbing apparel, and assigned to it the office of removing the root of the primary tooth. Delabarre, who treated this subject at greater length, and apparently investigated it more closely, adopted the views of Laforge." Prof. Harris, in the last edition of his work, where the views above will be found *in extenso*, says: "The more he has examined the subject, (of the destruction of the roots of the temporary teeth,) the more fully he has become convinced, that it is the result of the action of this fleshy tubercle (carneous body of Laforge) upon them. And while its formation seems to be the result of the contraction of the dental sac and its appendages, for the purpose of effecting the eruption of the permanent tooth, it is especially charged with the removal of everything that would obstruct its passage." Fox attributes it to pressure of the crown of the permanent teeth upon the fangs of the temporary; but admits, further on, that it frequently occurs without such pressure, and then remarks: "These circumstances seem to prove that the absorption of the fangs of the temporary teeth is an action of nature sometimes independent of pressure, and it is a very singular circumstance, that at a time of life when so great a quantity of ossific matter is poured forth from all the arteries concerned in the formation of bone, in one particular, there should thus be an absorption of this substance taking place." Bell rejects the theory of pressure, and attributes the removal to the action of absorbent vessels; he does not state whether veins or lymphatics perform the act. Nasmyth says: "The functions of the capsular membrane," or as he styles it in another part of his work, the *capsulo periosteal membrane* investing the fangs, "are of great importance at the period when the temporary teeth are removed

to make room for the permanent series, inasmuch as it is the agent by which the removal is effected." This view was also advocated in a paper read before the Odontological Society by Mr. Spence Bate. Tomes after describing the microscopical appearances presented by the fleshy mass found under the absorbed surface of the deciduous teeth, remarks, a few pages further on, "that all recent observers will, I think, admit that the dental tissues are removed through the agency of the growing papilla, and I do not think a difference of structure or function, referable to the particular tissues from which it may have arisen, can be established." He says, in conclusion, that "the observations, at present at our disposal, are not sufficiently numerous and varied to admit of the deduction of any general law, as regards the power by which absorption of one tissue by another is effected. But I think they point strongly to the idea, that a cell structure, in an active state of development, is capable of appropriating or removing out of its way a matured tissue."

The above constitute the various theories that have been advanced or adopted at different periods by dental writers in explanation of this phenomenon. Numerous as they are, to those who regard with any favor the views at present entertained by physiologists generally, in relation to histogeny or the development and formation of tissues, these theories must appear most vague and unsatisfactory.

In entering upon the consideration of this subject, the teeth must not be viewed as isolated organs, but as integral portions of the entire economy, and subject to the same influences that control the function of nutrition in other parts of the organism; and it must be remembered, that though nutrition is not an object of microscopic observation, it is a well attested fact, that, from the earliest period of fœtal existance until the cessation of life, two operations are constantly taking place in the elementary structure of the various tissues and organs, viz: 1. *Composition*, or the process by which the nutritive materials of the blood become assimilated; 2. *Decomposition*, or that action by which old parts are removed. These (constituting the function of nutrition) occur in every part of the economy, modified, however in their action by the age, constitution, state of health, and relative density of the different tissues; being most active in youth, greatly

lessened in old age; occurring with greater rapidity in vascular than non-vascular tissues. As a general rule, the greater the demand for the functional activity of an organ or tissue, the more energetic its nutrition. The osseous and dental tissues being the lowest in the scale of vitality, the change is slow, but nevertheless constant. Among the evidences of the renewal of the material of bones, are the formation of the cells, the development of the frontal and sphenoidal sinuses in childhood, the absorption of bones under the pressure of swellings, the absorption of the alveoli of the jaws, and the thinning of the cranial bones in old age, etc. The enlargement of the cavities of the bones, with enlargement of the whole bone itself, and indeed the mere growth of so solid a body by interstitial assimilation, and the changes that its form undergoes during it, are not conceivable without a constant removal of osseous particles from certain parts, and the deposition of similar particles at other parts; consequently not without a change of material.

As in the *development* and *formation* of the various tissues the primary active agents are *cells* previously existing in a structureless fluid called blastema, so in nutrition the end is attained by or with the help and continued energy of the *cells;* the materials of the nutritive process being present in the blood, *every tissue* and *every organ* attracts from it particles similar to itself. Nutrition, however, does not consist merely in the component particles of the organs attracting the fibrin, albumen, and other materials of the blood which flow through them, but the assimilating particles, through *cell agency*, must infuse into those newly added to them their own vital properties. Each *cell* that enters into the *formation* and *nutrition* of the different tissues is an independent organ, having a definite period of existence, and lives for itself and by itself, and is dependent upon nothing but a due supply of nutriment, and of the appropriate stimulus for the continuance of its growth and for the due performance of its functions until its term of life has expired.

In *decomposition*, or the continual waste which takes place in the tissues, and makes the supply of nutritive materials necessary, the drain is due to the continual disintegration, death, or destruction of the *individual cells* that have lived their appointed time. This death of the *cells* constitutes *molecular* death, in contradis-

tinction to *somatic death*, or death of the whole body. In these cells *every* tissue in the body has within itself the elements of life and of destruction. Such being the case, the necessity of an acrid substance, or a carneous body, to effect the disintegration and removal even of hard substances such as the osseous and dental tissues is not demanded; molecular disintegration fully accounts for it. The component cells having lived their appointed time, they degenerate, and their contents, assuming a fluid condition, are taken up by the venous or lymphatic radicals, neither of which can be looked upon as capable of breaking down any tissue; for the vessels distributed to a part, be they arteries, veins, or lymphatics, are but the *conduits* or carriers of nutrient fluids to and waste materials from the tissues.

After the various organs have obtained a definite size, as long as the two actions of *composition* and *decomposition* are harmonious, the repair being equal to the waste, the parts undergo no appreciable change of size or form; but if one or the other preponderates, *hypertrophy*, (due to excess of nutrition) or *atrophy* (due to deficient nutritrion) is the result.

Though generally regarded as the results of diseased action, either of these conditions may occur consistent with health. Thus the augmentation of muscle presented in the arm of the blacksmith or the leg of the ballet dancer, are familiar illustrations of normal *hypertrophy*. Exostosis of the fangs of the permanent teeth may also be mentioned as an instance of dental *hypertrophy*, which, though generally, is not always the result of diseased action.

As instances of *atrophy* occurring in the body as the result of a natural order of things, the Wolffian bodies, the supra-renal capsules, the thymus gland, the ductus venosus and arteriosus (vessels which are important in carrying on the circulation of the blood in the fœtus) may be cited. These organs and vessels having performed duties, some of which, if not all, are essential to the life of the embryo, and being destined for a temporary purpose only, upon the cessation of their special functions dwindle or disappear. Thus no trace of the existence of the Wolffian bodies can be found after the fifth month of utero-gestation; and the vessels so necessary to fœtal existence, after birth, shrink into ligamentous cords. The absorption of the fangs of the deciduous

teeth is but an illustration of *atrophy* of dental tissues, and the changes presented are analogous to the mutations that occur in the organs already referred to. The same causes that induce the one, effect the other. In each instance the explanation must be sought for in the modifying influences that control *nutrition*.

On this point as Paget justly remarks, in order that the process of nutrition may be perfectly accomplished, certain conditions are necessary. Of these the most important are:—

1. A right state and composition of the blood, from which the materials for nutrition are derived.
2. A regular and not far distant supply of such blood.
3. A certain influence of the nervous system.
4. A natural state of the part to be nourished.

Making special application of the preceding general principles to the subject under consideration it is necessary to present in the first place a *brief* description of the *development*, *growth* and *completion* of the deciduous teeth. In the development of the papilla of a deciduous tooth, the first stage is the formation of a *nucleated* cell, and the subsequent growth of the papilla is due to the multiplication and subdivision of cells originating from the parent cell. As early as the tenth week of utero-gestation, the twenty germs of the milk teeth are found in the primitive dental groove, and by the fourth month they are completely inclosed in separate cavities or sacs, this last act occurring in such a manner that *reserve sacs* are formed above for the papillæ of the twenty anterior permanent teeth.

By degrees the position of the *reserve sacs* and their inclosed papillæ is changed; from occupying a position above the deciduous germs, they retreat backward and downward until at last they are placed directly under them, and there eventually become surrounded by the bony alveoli. The dental germs here described are those that belong to the inferior maxilla; in the superior, the relative positions, of course are reversed.

During the period in which these changes occur, the deciduous papillæ, or pulps, increase in size, and assume the forms of the future teeth before the least deposit of calcareous matter takes place. If a *deciduous sac* is examined at this time, the *dental pulp* is found to be composed mainly of nucleated cells suspended in plasma, and a delicate connective tissue, similar to the hyaloid

membrane of the eye. A delicate, structureless membrane, the *membrana preformativa* (Raschkow,) in addition covers the pulp. Vessels and nerves are also present, the former being developed in great numbers when dentification commences, though they perform no other office than serving as conduits for a passage of the nutrient material, which escapes by transuding through their coats. Applied to the dental pulp like a cap is the enamel organ, which consists of an exceedingly delicate reticulated tissue, holding in its interstices a thick, transparent, albuminous fluid, in which peculiar nucleated or stellated cells are suspended. In the outer third of the enamel pulp a few vessels are presented.

The nucleated cells, both in the dental and enamel pulps, at first have no definite arrangement in regard to each other, but are scattered indiscriminately throughout the structure.

In the development of dentine, the first change that occurs in the pulp is the arrangement of the external layer of cells, end to end, in a linear direction. These elongate, coalesce and are converted into dentine by the gradual reception of calcareous salts. As soon as a portion of dentine is formed upon the apex of the pulp, by a somewhat analogous change in the enamel cells, the formation of enamel takes place upon and coalesces with the dentine. These two reciprocal actions continue until the crown of the tooth is fully formed. During this time a longitudinal growth of the pulp, and conversion, through centripetal calcification of the cells into dentine to form the root, also occurs. The tooth thus formed is forced up, presses against the gum, which is gradually absorbed and eruption is effected. After this the tooth is completed by the growth of the remainder of the roots. This is due, not only to the formation of additional dentine, but also to the development of the *cementum* which is formed from materials contained in the plasma furnished by the vessels of the periosteum. By centripetal calcification of the pulp the dentine is thickened, and the pulp cavity diminished in size.

In the tooth thus fully formed, the most ample facilities are afforded for the due nutrition of the dentine and cementum, by the transudation of plasma from the vessels of the pulp, and periosteum, through the dental tubuli, and the lacunæ, and canaliculi. For a brief season *repair* is equal to *waste*, and no appreciable

change takes place: but eventually a greater or less disintegration of these tissues supervenes, and the tooth loosens or falls out, or is extracted.

Exceptions to this rule, however, are presented, in which persons retain such teeth unchanged, and answering all the purposes of the permanent teeth for years—in some cases even to the fortieth year. Such teeth, though perfectly *firm* in their sockets and the roots *unabsorbed*, have frequently been extracted, under the impression that, having passed the period when they should have been shed, they prevent by their presence the growth and eruption of the permanent teeth; unfortunately for the patients, the looked for successors have entirely failed to appear.

Occuring, as the absorption of the roots of the deciduous tooth does, coincident with the development of the permanent it is reasonable to infer that the change is due to a modification in the nutrition of the organ induced by that cause: for no well authenticated cases are recorded of observations extending over a period of years in which the deciduous teeth have loosened and fallen out without sooner or later being followed by permanent successors.

To attribute, as some physiologists have done, the exuviation of the deciduous teeth to the fact that they have a definite period of existence, and when this has arrived they fall out as a necessary consequence, is not presenting an *explanation*, but stating a *fact*, to which there are many *exceptions*.

In seeking for the explanation of this phenomenon it should be remembered, as has already been stated, that the germ of the permanent tooth, after a certain period, occupies a position in close proximity to the roots of the deciduous tooth (separated by a bony partition;) in this position it remains for some time in a state of dormant vitality; at least with no increase in size. As long as this continues no apparent change takes place in the deciduous tooth; but eventually a new life springs up in the permanent germ; it draws from the blood the materials inservient to its *development* and *growth*, and in so doing removes from the current flowing to it and to the deciduous tooth, (through arterial twigs from the same main vessel) the constituents necessary to *repair* the *waste* that takes place in the latter. In many instances the supply is equal to the demand, of the permanent and de-

ciduous organs; and, under such circumstances, the development and eruption of the former takes place with little or no absorption of the latter.

In support of the position that atrophy of *hard* tissues may be induced by a deficient snpply of nutrient materials, it is only necessary to refer to the experiments of Chossat, who produced artificial atrophy and softening in the bones of animals, by restricting them to a diet in which no calcareous elements were present.

In addition to drawing to itself all or most of the nutrient materials from the neighboring current, as the permanent papilla increases in size, and the crown of the tooth is formed, it makes a graduated pressure, first, on the capillary vessels of the osseous partition and then on those of the deciduous tooth, thereby *diminishing* the flow of blood distributed to those tissues. By these two causes, not only the *quality* but the *quantity* of the blood sent to the deciduous tooth is modified, and absorption is favored. After the removal of the bony partition, the pressure of the erown of the permanent tooth may be either upon the vessels of the dental pulp or the periosteum of the deciduous. Of the effects of a *graduated* and *continuous* pressure in producing absorption of bone, the atrophied condition of the body of a vertebra ,that has been subjected to the pressure of an aneurism may be cited. In such a case, the pressure upon the capillaries of the periosteum does not cut off the blood entirely, (which, if occurring, wonld induce *necrosis*,) but merely diminishes the current so that the supply is not equal to the waste, and atrophy is the result.

Again, the influence of the sympathetic nerve in the function of nutrition must not be overlooked. Branches of this nerve are distributed alike to the pulp of the deciduous, and the papillæ of the permanent tooth, and there can be but little question that the development of the one and the absorption of the other is more or less dependent upon this nervous connection. Of the influence of the sympathetic nerve, in the nutrition of a part, the most striking illustration that can be presented is the experiment occasionally performed upon animals, of making a section of the ophthalmic branch of the trigeminus or fifth pair. In a few hours, or a day or two at the furthest, after making the section, inflammation of the conjunctiva takes place, ulceration is eventually established and the organ is completely destroyed.

Lastly, the fact must not be lost sight of, that the dental tissues are but a *congeries of cells*, constituting an animal matrix, in which the calcareous salts are deposited; that these cells have a different period of existence, and that by molecular disintegration they degenerate and are cast off. As the animal matrix degenerates cell by cell, their calcareous contents are liberated, and become mixed with the fluids to be taken up by the venous or lymphatic radicals. If in addition to this waste there is no supply of new material, atrophy is the result, and thus the roots of the deciduous teeth disappear.

In conclusion, these views are advanced under the conviction that the changes which occur in the dental tissues are in accordance with and controlled by the laws which govern the other portions of the economy; for in the language of the philosopher and the poet, all the operations of nature are governed "not by partial but by general laws." Upon the correctness of the views advanced it is not for the writer to decide. They are, however, his present honest eonvictions on the subject; but, wedded to no theory, and open to conviction, he would willingly change them to-morrow if satisfied that they are erroneous.

DISCUSSIONS.

DR. ATKINSON: I am very much gratified that this paper has been read at this time, and before I proceed to make any remarks as to the doctrine it contains, I wish to congratulate this body, and at the same time criticise or castigate them for not having paid more attention to such an excellent product of some fourteen years ago. I cannot say too many kind words and words of congratulation and thanks to my beloved brother McQuillen for the earnest effort that he made at that time to correllate and bring together in a presentable shape, the best authorities then pronounced, as far as I know: but then or now it will not do for us to talk of function and stop at cells, for we are as much at a loss to understand what the absorptive process is by simply understanding all that is nominated in the term "cell" if we stop there and do not inquire if there is something below that, as we are if we stop at "organ" or at "system," and that, I think, is the point that should attract our attention and engage our best efforts continually, as a new body, somewhat relieved from false precedents.

It is unfortunate to us that the term molecular metamorphosis has obtained such a world-wide acceptance, because it is not only molecular metamorphosis, but it is granular metamorphosis, and granular metamorphosis is that which breaks down cells; molecular metamorphosis is that which changes the fluid protoplasmic mass out of which granules themselves are formed, which takes place under the law of the activity of special combinations of affinity, subsisting in the elements of the molecules out of which protoplasm itself is constructed, and until we get right upon our knees and stick our noses into the very territory of the activities that we are speaking about, the function of modes of motion, we shall never be able to do anything more than pronounce mouthfuls of incongruous apprehensions, and we shall know no more than that the tooth was "absorbed", as they say.

It is very unfortunate that they should ever say that the deciduous root was taken away by absorption. What is absorption?

It is simply bringing to fluid again what had already been made fluid before it could go there, and that might as well be done in the presence of a carneous body and by the agency of a carneous body as anything else, if we were begining *de novo*, but that is not our situation; we are under law, and we are now investigating operations that present themselves to us in bodies capable of being seen and being improvised and misinterpreted.

Prof. McQuillen said "function was not a matter of microscopical observation. That is just half true and half not true. Because we cannot see the very origin of modes of motion and go to the last analysis of all the courses, down to final causation, therefore that we should not go any way in the chain, is precisely the point of difference between the so-called "physicists" and "spiritists," who account for the different formations of the different bodies with which we come in contact, in nature, when we are studying physiological activities.

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I wish to give a nomination, which perhaps will be new to some of you, so that we may get at the apprehension of what is before us. The Doctor very beautifully slipped over a whole world of truth, in a manner very common among naturalists, in speaking of metamorphosis and of the germ of cell-life. What does that mean? Until we go back to atoms shall we ever know what that does mean, and understand how atoms become formed together by a satisfaction of bonds of affinity, making molecules, and molecules by an irregular combination formed together in an irregular mass called granules, and how a regular arrangement of cells produces tissues, and a regular arrangement and correllation of tissues produces organs, and a regular posit of organs and an arrangement of them produces systems? Now where are we? We must go back and see what this alteration of generation of cells means. We must go in and behind the cells to know how they generate. We start with atoms. There are thirteen kinds of atoms that enter into the human body; but the basal ones are C, H, N, O, and it is because of the changes of the relation of these to each other that the atoms present us with molecules, and these are the bases of nutrition everywhere, and it is by virtue of the endowment of power in the above that we get any functional activity whatever.

Every time we deal with the cell we are dealing with the com-

plicated modes of motion that may be the result of full or partial satisfaction of the bonds of affinity resident in atoms, whereby they will be combined one with the other. Water is one example. It will not be water if it is not H^2 O. Any other combination of hydrogen and oxygen will be something besides water; but the instant that two measures of hydrogen and one measure of oxygen shall be brought into that known or unknown relation, by which their inherent affinities can express themselves, they cease to be what we call gases and become fluid. In their coming together they make molecules, so that the smallest speck of water you can get is a molecule, and not an atom; and there is where speakers continually make mistakes and call things by improper names.

As I said, satisfaction of affinity in atoms produces molecules, and irregular combinations of molecules produces granules, and they are the first bodies capable of being seen. We cannot see an atom, and we cannot see a molecule as such. They must grow to the size of granules before we can get any arrangement; then as soon as they are arranged into the form of cells we begin to differentiate them, and understand how it is. These are all made out of the protoplasm, or the molecular mass that is capable of making molecular aggregations, and the law of the bonds of affinity being exercised satisfactorily or acceptably, we get a healthy protoplasm, and there is no retrograde metamorphosis, either, because that is an ante-grade metamorphosis, and anything short of a full satisfaction is pathological in the degree of the minor expression of satisfaction. Then we may have sickly granules. If we have, we cannot have healthy cells, and if we have sickly cells we cannot have healthy tissues, and if we have sickly tissnes we cannot have healthy organs, and if we have sickly organs we cannot have healthy systems.

I know many patients between the ages of twenty-five and sixty who have their temporary teeth still fast in their jaws. They say it is the advancing tooth that causes *absorption.* Why absorption? First *solution* before *absorption* always; why not then say *solution* of the calcareous shell that holds the germ of the permanent tooth in it? Here is a relation that we do not understand—some develop to a certain extent and stop, and others develop entirely to the complete development of the teeth

without being erupted at all, still leaving the roots of the temporary set intact, connected in all their ways, so that the circulation is going on. It is the machinery of circulation that we have dwelt upon continually, supposing we had got to the foundation of functional action, and had traveled the world of causation; and we have been dealing only with the machinery—with the implements of function. Now what is function? There is where we get into the quarrel. Who stands there to say when there is enough of these cells deposited to make a complete muscle or other tissue of any kind? Why, that master builder, the little typal presensce, that says there is enough when you have four fingers and a thumb, and we see, when that is disturbed, sometimes five fingers: so that we must deal with these deep and hidden causes of combination of affinity before we can get at anything like function.

Now we are exactly at the poimt where physicists and spiritists disagree, and we must resolve ourselves into both before we can get at the truth, and I will give you the name of "dynamic atoms," and when we understand dynamic atoms and physical atoms we can go on and talk of function. The nervous system set off against the vascular system will exactly be accounted for. We have the positive neural blood, so to speak, that is the representation of the dynamic side, and we have the negative vascular blood, which is the negative or physical side of organization, and when we shall understand how these come together and what kind of food ministers to the full preparation of the pabulum of the dynamic molecule and the pabulum of the physical molecule, we shall be able to get something toward what causation is; but until we do that we shall spend a great deal of time on old nominations that we shall be sorry that we ever learned, because we shall have to unlearn them; and I would advise any of you who desire to study microscopic anatomy, never to read Schleiden and Schwan, for they will be stumbling blocks—rocks of offense in the way. You had better spend two nights with Dr. McQuillen over a specimen, and read the book of nature, and you will not have differences of opinion and differences of presentment because you are looking at different things.

Dr. KNAPP: I was very much pleased with the report that was read on this interesting subject, and glad to notice that some

of the quotations were made from the very excellent authority on dental physiology, Mr. Tomes. The writer, however, omitted one important fact put forth by Tomes, and verified I believe by the observation of nearly every dentist who has had opportunity for observation, namely, that there is no absorption known to take place in a deciduous tooth after the loss of the vitality of the pulp. The writer of the report stated that absorption of the roots of the deciduous teeth take place in a measure, not so fast as is characteristic of teeth with living pulps. I think that whenever we extract a devitalized tooth of the deciduous set and see that some absorption has taken place, it is no proof to us that that amount of absorption did not occur previous to the loss of the vitality of the pulp. I believe it is a well known fact at the present time that the vitality of the pulp is essential to the process of absorption.

Dr. JUDD: I have but few words to say on this subject, and I shall confine my remarks to the subject of absorption, speaking of absorption, however, in the usual sense. It is true as Dr. Atkinson said, that the original sense of the word is, to suck up or take up, but at the present time it usually comprehends a little more, and it is getting to be used by a great many authors in a sense in which it comprehends, likewise, the breaking-down process of the hard tissues. Keeping in mind this idea, which seems to be growing in the use of this word, I shall not be misunderstood; and I wish to speak simply in relation to the differences between *atrophy* and absorption, for I apprehend they are two entirely different processes. As I understand atrophy and as I understand the term absorption, there is in reality no especial connection or analogy between the two. In speaking of atrophy as I understand it, we mean a molecular disintegration that is not recompensed by progressive metamorphosis. We know very well that in the living tissues progressive metamorphosis and retrogressive metamorphosis are constantly going on. You arrest the process of nutrition and the retrogressive process still goes on, and we have true atrophy in such cases as that.

Now, in the case of absorption as we understand it, when we speak of the absorption of the roots of the deciduous teeth, we have as it were a cutting away of the whole tissues, and not simply a removal of the molecules within a tissue. There is a cut-

ting away of the whole root, an entirely different process, not a shrinking down of the root, as we find in soft tissues that are atrophied, and therefore I say it is an entirely different process.

I speak of this because I believe that Dr. McQuillen still holds to the same doctrine that he taught in that paper, and a very admirable paper it was for one which was written fourteen years ago, in relation to this doctrine, and in combating the idea that was brought out by the paper that was read by Dr. Dean, he asks the question, whether or not in the hollowing out of the medullary cavities of bones, etc., there is any carneous body there to produce this absorption of the bony tissues. If I understand Kölliker in his remarks before the German society of physicians, at Vienna, in which he brought out this doctrine of the breaking down of the roots of teeth by means of ostoklasts,—not that he originated it there, but in which that was a prominent part of his argument, I understand him to claim that in all cases of true absorption of bone and of teeth these ostoklasts are found; that there is a veritable carneous body in every instance. It does not however, it seems, present the exact appearance that we see in the case of the deciduous teeth, where there is a compact solid mass of cells, but these ostoklasts (which differ essentially from the ostoblasts, or those that build up the tissues,) are always found, according to the doctrine which he brought forth in his paper, and his remarks upon the subject, as I understand them, were principally to bring out this fact as something in advance of that which had been heretofore known.

It struck me that this was a point of considerable importance. If this be true it is a considerable advance upon our former opinions and theories in this direction; not by any means that it explains everything in relation to this process, but we are constantly getting nearer to the gist of the matter; we have passed at least one step in advance if we discover and demonstrate that wherever the absorption of hard tissues take place these ostoklasts are always found.

There was one question that Kölliker touched upon in that discussion, and it was discussed at some length by other members of the German society, and that was in relation to the origin of these "giant cells." That question, as far as it has been investigated, leads us into a mystery that they have not been able

thus far to solve, as we ever find it almost, when we tear aside a veil that covers up one thing that has hitherto been hidden from our sight, we only reveal still further mysteries. We want to go on now and resolve these other mysteries which the explanations that Kölliker made have only brought to view.

SOME OBSERVATIONS

ON

Diseases of the Enamel.

By HENRY S. CHASE, of the Committee on Dental Pathology.

NOTWITHSTANDING the compact structure of this substance, it is in early life subject to inflammation, and malnutrition, and at later periods, though not manifesting the same signs of inflammation that are exhibited in softer tissues, yet undoubtedly it does go through some of the movements which result in inflammation and *death* of the tissue.

During the development of the permanent teeth, and before their eruption, or even after eruption, all those portions of the dentinal crowns which are still covered by the gum, or within their respective sockets, are peculiarly liable to be injuriously affected by skin diseases accompanied with much fever. Scarlet fever, small-pox and measles leave their impress upon the enamel with the greatest certainty. The enamel organ participates in the dermoid inflammation, and the enamel prisms cannot easily escape. The delicate sheath which envelopes every prism, being of the same histological structure as the enamel membrane itself, is easily affected, and every prism undergoes inflammation. These delicate sheaths constitute the *basal* structure of the enamel. It is into these cells that the fluid phosphate of lime is invited, and becomes crystalized. Upon the severity and extent of the inflammatory process depends the appearance and physical condition of the enamel after the tooth is erupted. Let us keep in mind that at this period cell life is in the greatest activity, in all parts of the body. Work is going on incessantly in every organ, and every

tissue. *Building* is in progress, but if the workmen are sick the process is arrested. When there is *general* disease the appetite fails; digestion suffers; food is *not* made into pabulum; protoplasm is deficient, and there are no *materials* for building, even if the builders were able to work. So here, in the teeth, if nutrition is arrested then *absorption* only is active, and a line of depression will show around the tooth after its eruption, marking the exact degree of development attained by the tooth at the period of sickness. The width and depth of the furrow will also correspond to the length of the sickness and its severity. Wool of sheep, hair, and nails show the marks of defective nutrition, caused either by sickness or a paucity of food. I have to-day (July 15th,) a depression or groove running across each thumb-nail, caused by a fortnight's illness in March. The grooves or depressions so often observed on the incisors and other teeth, are the result of arrested development. The white soft chalk-like spots on the enamel are caused by inflammation of a small number of enamel cells while their contents of phosphate of lime were yet uncrystalized. Stasis resulted and the lime salts, in that chalky enamel, are to-day not in such a state of crystalization as is produced by healthy vital action, consequently there is no firmness or density to the tissue.

That enamel which appears seedy or granular, and is yet *hard*, was produced by inflammation and consequent shriveling of the enamel membrane *after* the enamel cells had partially crystalized their contents. In healthy and naturally developed enamel there is a free circulation of the blood plasma, through every enamel cell membrane; not by vessels of course, but through osmotic action, such as takes place in every part of the body, at a greater or less distance from arterial vessels. The activity of nutritive movements depends on the age of the individual; for it is well known that as age increases, nearer and nearer a static condition is reached, which at last may become nearly perfect in some of the hard tissues, as doubtless it is in the enamel. It is important that we keep these facts in mind when we are making observations upon the teeth after eruption. Every *experienced observer* knows that all the hard tissues of the teeth are in a state of greater or less mobility before the fifteenth year; and the writer believes for a long time afterwards. The enamel, before this

age has not upon its exterior that vitreous appearance that it assumes later in life. The latter is owing to a more perfect crystallization of the lime salts. As we extend our investigations deeper into the enamel substance towards the dentine, we find less and less compactness, for that part lying next to the dentine hardens later than the exterior portion. The exterior is always in advance of the interior. The same remarks will apply to the dentine; but in the *latter*, nutritive changes take place to a greater extent, and more rapidly than in the enamel, just as might be expected, for it is a softer tissue.

A large number of observers have demonstrated that absorption often takes place in the dentine, and a smaller number have also demonstrated that it does in rarer cases in the enamel itself.

We have seen that inflammation of the enamel membrane, before eruption, causes necrosis of that tissue; and now we wish to see how that pathological result may be observed to take place in the enamel of teeth already erupted. Let me tell you what I have hundreds of times seen, and then we will try to arrive at a theory which will explain the phenomena.

I am looking into a fifteen-year-old mouth, and I see the anterior surface of a right under first molar. It is smooth and vitreous in appearance, and has *no* abrasion or crack in this surface. But there is a whitish spot near the centre of this surface. It is *off* color; it has lost its polish; it cuts like rock salt; as I penetrate further it cuts easier and easier, until I arrive at the dentine which latter is as hard as we find it at eight years after eruption.

I see the same tooth in a person aged twenty; the spot is brown instead of white; it has a vitreous appearance, smooth and without sign of disintegration; it cuts hard at the *surface*, but immediately under, the thickness of tissue paper, it is pliable and chalky, and when the dentine is reached, the latter is found more or less softer than natural; apparently decalcified, and a considerable portion is found bounded by harder tissue.

I see the same tooth and surface in the mouth of a person aged twenty-five; the spot is black, vitreous suface, but no disintegration, no roughness; the blackness penetrates the enamel; shading off into dark brown, until it reaches the dentine, where it still shades off into lighter brown, until the natural color of the healthy dentine is reached. This spot cuts at first like feldspar,

then less dense; not porous, but before reaching the dentine becomes so; afterwards like dry hard wood across the end of its fiber; finally shading off into the natural density of dentine. The previous condition of this tooth was that of *pressure*, caused by one now extracted. This is not a case of caries, or chemical decay, but one of arrested circulation in the enamel fibers, followed by *stasis;* and this extending to the dentinal tubes by inflammation as a cause, and the calcification in territory next to the one of stasis.

Spontaneous abrasion or denuudation can only be fully explained by a theory which covers the whole ground that I have partially gone over, namely, that vital action plays an important part in all pathological conditions, both of the dentine and enamel. If those who disbelieve this play of vital action in erupted teeth will take the trouble to look into the literature of the subject, they will find many cases recorded which illustrate and confirm its truth. In "Wedl's pathology of the teeth," he has cases recorded instances of united fracture of enamel in *adults*, besides many similar cases.

DISCUSSIONS.

Dr. Atkinson: This subject is one of such manifest importance that every man here ought to wish to speak upon the subject, if nothing more than ask a question, to prove that he is in earnest to get at the understanding of the calling by which he makes his bread. The subject is a continuation of that which we have been discussing, and the paper is full of statements that are gratuitous, and we have to supply some ellipses that he has left in his statement of the facts. He says that the hardening of the dentine takes place from the periphery inward. If he means the action that takes place by infiltration of lime salts into the imper fectly formed spots of the dentine he is correct.

Something he said with regard to skin diseases. In a general way that is true, but he said that the enamel was a dermal pro-

duct.* I am sorry for him; I am sorry for the world if they do not get along any better than that. Enamel is epidermal, dentine is dermal, the pulp is hypodermal in its origin, and this correllation of parts holds good throughout. If we speak of enamel cells and enamel prisms, then indeed, we are talking intelligently and intelligibly; but these points must be understood before we can comprehend that, and further than that, the enamel is complete at about the time that the second or third ring of dentinal fibrils are formed below the neck of the tooth, so that the enamel or the materials may be washed away, and these white spots that he speaks of may be the result.

It is a pretty good stretch to say that the intertubular portion of the dentine can be inflamed. I doubt whether it is legitimate to say that inflammatory action can take place outside of the dentinal fibrils.

Dr. JUDD: I agree with Dr. Atkinson in relation to the paper, where he states that there are statements made that are entirely gratuitous; not but what they may be correct; and I shall refer to some statements particularly, and a few that I think may be incorrect. In relation to the inflammatory process that is carried on within the enamel, and the process that is so well marked out there, and the subsequent changes that take place, he attributes, without any doubt whatever it seems, to an inflammatory action. You will recollect that I have always objected to such statements before this body. I have no objection to a man arising here and telling us what is his opinion on this or that subject, but I do object in all our papers of that kind, to statements that cannot possibly be demonstrated by any experiment, and never have been or proposed to be demonstrated, and set down as an undeniable fact, simply because the man who wrote the paper thinks so.

I suppose this is the only paper we are to have upon pathology, as far as I can learn, and it opens the door to the discussion of anything of a pathological nature that may arise, and without going into a refutation of the doctrines in the paper. Indeed, I do not wish to refute most of them. I wish to state some few facts relating to doctrines that are brought forth, and some that

*[Dr. Cushing, who read the paper, called attention to the fact that the statement of the paper on this point had been misunderstood by the speaker.]

are not brought forth in the paper perhaps, in relation to the idea of the gentleman that there is circulation in the enamel. We must confess that he is going further in that direction than most physiologists of the present day would be willing to go. The word circulation, at any rate, to my mind does not seem to be the proper word here, even if nutritious matter does penetrate the enamel itself, it is a permeation of the nutritious matter, and it certainly cannot be anything more than that. You take a piece of marble for instance, and throw a little water upon it, and it permeates the marble; you take a piece of common limestone that will not take a polish such as marble does, and it permeates it much more readily. The enamel certainly can be permeated by fluids; there is no question in my mind about that, and I can account in no possible way for the condition which we speak of as "setting the teeth on edge," except by the permeation of the enamel by fluids.

In relation to the permeation of these tissues by matter, and the penetration of the enamel by nervous fibres I wish to say one word. I am not going to put forth the doctrine as established by any means. You all know that for a long time it was supposed that nerve fibrils did not penetrate the sheath of the muscular fibre, but close examination under the microscope demonstrated that they do penetrate into the interior portion of the muscular fibre proper. Another doctrine was that they did not reach into the epidermal structures, but subsequent closer observations show unmistakably that they do penetrate into the epidermal structures and between the epiderm cells, and they do in reality reach the very surface of the epiderm itself.

There is another question that is hinted at in the paper in relation to the abrasion of the teeth, and at the time it was mentioned a thought struck me in relation to that. Perhaps I have spoken before this association before on this subject; however that may be, it is a subject that I have thought a good deal upon; and the question arises what are the pathological conditions in abrasion and caries? Why is it when we have a destruction of the enamel by abrasion that we do not have caries in that location? I believe that in cases of caries that the shaping of the cavity, and the direction of the action of the disease towards the pulp particularly, is due to the influences of other agencies be-

sides acid. There is certainly something besides the action of acids here to account for the direction, the shape, the formation of these carious cavities. We must have something else, and I am inclined to think—I don't say it is demonstrated—but it is my opinion that we have to deal with the *leptothrix buccalis* here.

Dr. Bogue: I have jotted down within the last few moments the heads of what might he said upon this subject. I have no written paper upon it.

The frequent use of the word nerve by dentists, when the pulp is meant, leads one to believe that some of the more obvious changes that take place in this pulp in nearly all cases are overlooked. If the body within the tooth were really a nerve there could be no such pain as tic-douloreaux, the jumping toothache, since this manifestly proceeds from engorgement of the circulatory vessels of the pulp to such an extent that the beatings of the heart are felt by the nerves of the pulp. Sequences of cause and effect in the usual form of toothache may be stated as follows: First, irritation, which in different persons manifests itself differently; but I fancy in nearly all it would manifest itself by sensitiveness, and it scarcely needs that your attention should be called to hyper-sensitive people to know how quickly they are aware of cavities existing in the teeth, sensitiveness being caused of course firstly and most largely by decay, again by abrasion, again by fracture, and in other instances by recession of the gums and alveoli.

Not to speak of the more unusual cases, but to proceed at once to the very common cases as the only ones under examination, the second state would be that of inflammation, which would exist where the pulp was nearly or quite exposed from decay. The presence of any irritating substance within the cavity of decay, causing pressure upon the pulp, would necessarily cause inflammation there. Why? If we irritate any portion of the body we know that an increased flow of blood is immediately apparent. The same thing I believe takes place when the pulp of the tooth is irritated, and when the irritation has proceeded to a certain point inflammation supervenes. We then have, not the dull pain and sensitiveness, but the acute pain, which the patient describes as toothache. The more intense the pain, the more rapid

the flow of blood to the part, the throbbing of the heart being felt up to the very last moment, when the pulp is being gorged to the utmost and strangulation takes place; the pain ceases immediately.

In looking at the question from this standpoint, if it be a correct one, I think we may see how we may be of service to our patients in relieving the pain all along this road. The first irritation or sensitiveness, of course, is at once relieved by filling with a non-conductor; when the irritation has become greater, verging on to inflammation, I believe the proper course is to find the point, and prick it and let out a half drop of blood, and relief will be almost instantaneous. I have many times succeeded in giving relief within two or three moments by depleting the pulp from two to three drops, scarcely ever so large an amount as the latter. Unfortunately our patients are not aware that relief can be afforded, and they wait for the toothache to cure itself. There is a self-cure: that self-cure is death to the pulp. What next? Immediately supervening upon the death of the pulp in these ordinary cases we have putrefaction and disintegration, resulting in the conversion into gases of the fluids and soft-solids of the pulp, sulphuretted hydrogen and oxygen are mainly developed—these gases occupying of course greater space than the solid portion of the pulp in conjunction with decomposed and decomposing fluid substances. We here at once have a foreign substance placed beneath the peridental membrane, requiring but the proper condition of things in the system to develop an abscess.

Dr. MORGAN: That the enamel is a vital structure I suppose will not at this day be questioned. Every analysis I believe that has been made shows that there is at least a small portion of animal matter, and if so, it must of necessity be subject to the same law that animal matter is in the other tissues of the body, viz.: wear, and death, and removal, and a supply of its place. It may be that this vitality, this animal matter only exists in the connective tissue that remains between the prisms of the enamel.

I have not yet satisfied myself that there is sensibility in the enamel. I have yet to see a case of the setting on edge as it is termed, where I was satisfied the enamel was perfect. I think sensibility only resides in the dentine.

It is known to all who have freqently examined specimens

through the microscope, that in a good many cases, especially in young persons, the dental tubuli seem to penetrate very far into the enamel, and in some cases entirely through it. The microscope reveals the fact that there are little passages from the surface into the dental tubuli in a good many cases. In these cases you may have sensibility from the effects of the acid, that sensibility being confined to the dentine, and not involving the enamel at all. I agree with the gentleman that the enamel will absorb fluids. A tooth taken from the mouth and remaining a few hours on your case will show that it has undergone material change by its color. The immersion in water or any other fluid will restore that color.

Dr. TAFT: The paper read last night upon the abnormal and pathological condition of the enamel was, in some respects, a good one. This tissue is a very important one, and it should be studied in all aspects in reference to its normal structure, and in reference to the abnormal conditions which it is liable to take on, that may occur to it, either hereditarily or accidentally. There is a great variety in the structure of the enamel, occasioned by one thing or another. It is very rarely that anything approximating an enamel perfect in structure is found. Some defects are transmitted from parent to child, others occur because of accidents or interruptions in the development and nutritive process during the time of the formation and growth of this tissue. Oftentimes there will be an absence throughout the entire structure of that perfect crystalization that characterizes the best examples; then again there will be defective tracts or points in the structure. Some of these were referred to by the paper last night, and by the speakers. These will sometimes manifest themselves in the points denominated atrophied portions or those parts of the enamel where the nutritive function was arrested to a greater or less extent during the formation of the tissue by some active disease, occurring for a time, and marking itself upon the enamel, markirg itself upon the nails and upon the hair, as was mentioned last night. This class of defects will be shown by spots differing in color from the better formed enamel round about. In some cases they are found to consist of grooves, in other cases of a series of transverse points across the enamel at the points in formation at the time of the affection. Then again there will be

found oftentimes imperfections of the enamel in the fissures where there will be an opening.

There is oftentimes an opening in the fissures of the enamel, the crowns of the molars for example, the lingual surfaces of the superior incisors, especially the central, and sometimes the lateral, and sometimes the cuspids, opening through these depressions, extending partly and in many cases all the way through the enamel to the dentine. Then again there is another class of defects of the enamel, exhibited by marked defective tracts or channels through the enamel, either partly or all the way. These will begin many a time at the inner surface of the enamel; at that portion of the known dentine and extending all the way through or only part through it.

These tracts are entirely different from the defects found in the fissures and in the pits of the enamel. They may occur anywhere and are oftentimes, perhaps as often as otherwise, found in the enamel, and coming out or pointing towards or terminating upon the cusps of the teeth.

Sometimes decay will begin upon the cusp of a tooth or at any particular point and permeate the enamel, and a definite opening will be formed by decomposition through the enamel, and the wonder oftentimes is how that occurs, since nothing could be deposited there, as ordinarily deposited upon the approximate surface of the teeth, or as is oftentimes forced into the depressions and pits of the teeth and retained there until decomposition of the material takes place, and agents produced that will occasion decay of the enamel. Decay beginning on the cusp and passing through a small opening to the dentine, decay of the dentine will take place. These tracts, especially where they are definitely marked and amount to an opening or passage through which fluids may readily pass, will afford great facility for the operation of decay-producing agents.

There are other defects of the enamel that pervade the whole structure. These will be exhibited by that imperfect character of the enamel throughout, sometimes presenting a structure almost without any organic character at all, simply the materials thrown together in a very imperfect manner, and this condition will oftentimes pervade the whole structure of the enamel; then again in some cases the dentinal fibrillæ will be found to extend from

the dentine into the enamel to a great extent, and sometimes, as was stated last night, entirely through the enamel to its periphery. I have a specimen which I should have brought with me this morning—a photograph by the late Professor Hitchcock, showing this clearly, where the largest number I have ever seen of the fibrillæ pass from the dentine through into the enamel.

It is impossible here to go into anything like a thorough examination of detail in all these particulars, and indeed I do not believe that this association is the place to study to the bottom all these subjects. If we can talk about them and stimulate each other to a further study of the subject and a further investigation of the matter we shall have done about all that it is possible to do in a body like this. These structures should be well studied in all these particulars. All the witnesses that are present should be examined, all the peculiarities that exist should be noted in order that we may ascertain how much these different phases modify the treatment that should be given to the different teeth.

When disease attacks the body it leaves tracks upon all the tissues of the body to a greater or less extent, and especially upon those upon which its force is most definitely expended. It is true that we cannot look upon the face at once, perhaps, with our present knowledge, and say, you were sick at one time, you were seriously affected at one time in your life, during a time of growth and development; but perhaps a time will come when we shall see more clearly than now. These impressions made upon the teeth bring to us a lesson in this respect, and it ought to encourage us to study all the tissues of the body so that we may be able to read from them the difficulties and struggles through which the organization has had to pass, that we may be able to learn how they are now able to withstand the assaults that may be made upon them.

Then let us study the enamel in all these particulars and many others that I might mention; let us study the dentine, for there is quite as large a field for investigation in this particular as in the enamel. It is true the dentine does not stand out in a well formed and covered tooth, to the observation, but the lessons taught by the enamel may lead the thorough physiologist and histologist to conclusions in reference to the condition of the dentine, whether it is more or less well formed.

The dentine possesses many peculiarities, abnormal and pathological in character, that it is well for us to study. Variations will be found all the way through. It is true that this variation in the elementary structural character teaches to us the lesson that they are, in different degrees, able to resist the influences that might be brought upon them. All that should be recognized clearly by us in reference to the teeth, and not only in reference to the teeth, for we cannot study these things with reference to the teeth without being led to discover them in the other tissues of the body, and understand them so that we read the whole book instead of reading one page of it.

One thought more with regard to the defects of the enamel and dentine. In studying them it is well for us to make our analysis as close, and criticise as sharply as possible, and every defect that is found upon the tooth should suggest the inquiry, how comes this difficulty, has it come from parent to child through successive generations of people, or is it an accidental thing that has occurred by some interruption of the developing process during the time of the growth of the organ. This is a very important matter to decide. If it is found to be hereditary, there will be far more difficulty in eradicating it. If defects of this kind have occurred and they have resulted from some accidental cause during the growth and development, we shall not expect to find that transmitted to future generations; the offspring of such a one will probably not partake of that defect. They may partake of it, and they oftentimes do partake of it, but there is not the same certainty of transmission of the defect as though it had come from parent to child through successive generations, but though that has been true we are not to give up the case and say nothing can be done. Let us endeavor to redeem so far as possible even these defects and these imperfections that have been transmitted from parent to child.

Decay of the dentine was referred to last night, and the parasitic theory was spoken of. I have not been able to work myself up to any great degree of interest in that respect, not much more than I would to examine into the fact of the existence of the little animals that pervade the dead carcass after it has been dead for some time. Living animals are found in the dead carcass after life has gone, but they were not the cause of the death.

They exist there after the animal is dead, and I think this is about the case in reference to the teeth. I have not been able to see anything to lead me to the conclusion that parasites play any considerable part in the production of decomposition of the dentine. I know there have been many suggestions in reference to this matter and the fact of usually finding something of this kind in connection with decayed teeth has been regarded as evidence that they play an important part in the process. Because worms and bugs are sometimes found in dead and rotten wood I do not therefore conclude that they were the occasion of the death and decomposition of the tree, but they are there because that condition has occurred, and they are there after life has departed, after the functions pertaining to it have ceased, after decomposition of the structure has to a certain extent occurred, they are present and not until that time; and so I regard it in reference to the teeth. So far as they may inherently belong to the material that occasions decomposition of the teeth, they may have connection with the matter, but no further than that as it seems to me.

Now it is true that in some materials, living beings, living parasites will be found almost always, and such will be their natural abode, and this may be true in regard to some of those things that produce decomposition of the dentine.

How does decay of the teeth penetrate into the dentine? Very variously indeed; sometimes beginning upon the surface and extending over a large territory, not penetrating deeply at all, sometimes becoming arrested when it has operated merely superficially, sometimes it will extend largely beneath the enamel, between the enamel and the periphery of the dentine, affecting the dentine very little, but burrowing beneath the enamel, between the enamel and the dentine. In other cases it will make a strike like a shot, as it were, through the enamel and through the dentine, by a very small opening, and penetrate to the pulp chamber. In other cases it will burrow down to the dentine, penetrating as it goes until it involves nearly the entire crown of the tooth before the pulp-chamber is reached. Why these variations? There is, as you who have given any attention to the subject all know, almost an infinite variety with regard to the manner of penetration of decay, and it is easily accounted for. Decay may attack the enamel or the enamel be destroyed from one

cause or another. The granular layer, or that material between the enamel proper and the dentine, varies greatly, and that structure ought to be well studied by us. It will be impossible for us, without a study and a knowledge of this structure, to understand this subject of decay, and the various affections that attach to the teeth. The structure is sometimes exceedingly thin. Sometimes the perfectly formed enamel seems to lie down almost directly in contact with the perfectly formed dentine. In other cases there is a thicker portion very imperfectly organized between the two, denominated sometimes granular layers. Now where this is very imperfect, decay-producing agents will operate upon that far more rapidly than upon either well organized enamel or dentine, and so decay will be found running largely beneath the enamel, not penetrating deeply into the dentine, but occupying a large extent of territory over the periphery of the dentine. Suppose this structure or this material is good in character, and a well formed enamel comes down upon the more perfect structure of the dentine, and there is very little space there indeed to be operated upon, and the dentine is imperfect, this penetration into the dentine will take place, and if there is an imperfect tract in the dentine, as there often is, as well as in the enamel, they become penetrated by a small opening down into the dentine and through it many a time into the pulp-chamber. Sometimes decay will penetrate to a considerable distance toward the centre of the tooth on the line with the tubuli of the dentine, penetrating to a considerable distance, and seeming to be arrested, and then it will sometimes turn out of its course across the fibrillæ, be arrested in its course towards the pulp chamber and pursue some other course. It operates upon the tissue, which is most easily broken down, so that all the peculiarities observed in the progress of decay, in its penetration through the enamel and into the dentine are easily explained it seems to me.

I do not imagine but that in many cases there is a concentration of the agent, producing decay at one point in a cavity when in any other point of the cavity it would not act with such force. It may be active at one particular point even within a small cavity, and less active at other points. In the production of decay-producing agents decomposition and recomposition take place. That may exist all through the cavity alike or there may be a

particular point where this decomposition and recomposition will take place at a small point and not be active elsewhere. Just where that takes place of course there would be the greatest action of the agent produced upon the dentine.

I have examined this subject of decay of teeth with reference to these theories that have been suggested with regard to parasites, from the beginning almost to the present time, and as I said in the beginning, I have not been able to find anything that comes with any force, anything approximating demonstration that parasites play any part at all. I do not want what I have said to be taken and criticised as a thorough examination of this subject. I have simply referred to a *thing* here and there merely to drive down a stake here and there with reference to the matter. It is susceptible of being discussed and made clear and plain all the way through it seems to me, comparatively so at least.

Dr. SPELLMAN: With reference to this subject under discussion I beg leave to remark that recent histologists, I believe, discard, or very many of them are discarding the animal theory that has been advanced here and are substituting for the same a vegetable or fungus theory. Some of my hearers no doubt will hold that the development of this leptothrix ultimates in the production of these parasites. As I understand the present theory of microscopists, and I refer to a recent work published by Lieber and Rottenstein, they discard that theory entirely; they deny that parasites are necessarily the result of this fungous growth. In every stage of decay they find these leptothrix attaching themselves to the enamel, as the lichen fastens upon the body of the tree, or the sponge upon the rock, and acids finding a ready receptacle they act upon the lime salts of the enamel, causing the same to break down. As soon as this decomposition of disorganized enamel takes place, the enamel is penetrated and exposed to the action of the acids which are held in contact with them, by the development of the leptothrix, and penetrating parallel with the enamel rods finally reach the dentine. Then the leptothrix find lodgment in this debris, and it then has soil in which to develop itself into full growth. The shape of all decay, I need not tell this assembly, after the penetration of enamel, is directly in the direction of the pnlp, and this development of the lep-

tothrix is carried on by the parent throwing off spores, these spores taking lodgment in this pabulum, forming a connection with the parent stem and proceeding in this way until the complete destruction of the tissue or dentine, when the pulp is exposed. This as I understand it, is the theory of the most recent and learned histologists. I do not understand that it is necessarily a parasite operation by any means; but the growth of a vegetable fungus.

The fluids of the mouth are capable of maintaining and supporting a vegetable product peculiar to their own nature. The most recent, and to my mind the most reasonable theory is that the leptothrix is the product of the secretions of the mouth, and their cause in the development of *caries* has not been fully understood nor developed.

Dr. WATT: Years ago, in the mouth and out of the mouth, I produced artificial caries, imitating all of the four varieties, precisely every form of dental caries that I have ever seen in the mouth, or that I have ever heard described or read descriptions of. Months in succession I have had mouths *rented* that had a few remaining living teeth that were sometime to be sacrificed. You all know that I have not concluded that I was master of all subjects, and the microscopical examinations I have entrusted to other parties, and they did not find these little bugs or whatever they are called, and I think they were not there; at any rate I was not particularly concerned if they were there.

The white decay is the most penetrating and makes the rapidest reaches for the pulp cavity. You will nearly always find that in the mouths of patients who ordinarily have an alkaline reaction of the fluids of the mouth, most, if not nearly all of that alkalinity is due to the presence of ammonia, which is highly soluble in saliva. The formation of nitric acid, possessing all the activtiy of the new birth, is the production of an agent which is able to eat up everything there is about a tooth, enamel, dentine or cementum. It has a stronger affinity for the lime salts than for anything else. It dissolves the sub-phosphate of lime without decomposing it. Acting with less force upon the enamel matter of the tooth it leaves a portion of that enamel matter to do what?—to undergo decomposition by the action of oxygen. The repetition of this process in the cavity of the tooth explains the pene-

trating power, and I think there is nothing eaten in any other way.

We have another phenomenon resulting from this ammonia. For example we will have, in such subjects, a spongy condition of the gums, and a flaccid condition of the mucous membrane of the mouth, and we will usually have a very rapid deposit of not very firmly crystalized tartar. It will accumulate in great quantities, producing a diseased condition of the mouth in general, but especially a granular condition of the membrane attaching the teeth to the socket. How does the ammonia do this? In this way; the carbonic acid which is held in the solution helps to keep the carbonate of lime in solution. The lime is held in solution by the excess of the free carbonic acid, which is dissolved in the water. Now, by heating the water free carbonic acid is expelled with a moderate heat, and then the carbonate of lime is precipitated. Examine tartar formed under these circumstances; you will find it richer in animal matter, richer in foreign matter than the ordinary tartar, and it will be richer in proportion in the carbonate of lime than in the sub-phosphate of lime. I never saw a specimen that did not contain both salts.

I might go on and consider the other acids, but one type is an explanation of the whole four.

Dr. MORGAN: In his remarks, Dr. Taft set forth the fact that wherever there was arrested development, it left its mark, as a rule at least, upon the enamel, so distinctly that it could be read, and intimated that it might have left its impression throughout the entire system. I have been profoundly impressed with the idea for some years past, and my reason for calling attention to it now is because of its great practical value in the practice of dentistry. Whatever condition there may be in the deciduous teeth that interferes with nutrition to any considerable extent, leaves its permanent impress, not only upon the permanent teeth but upon the entire tissues of the body. They are never entirely repaired, and if they are defective, life is shortened because of that defect. My reason for calling attention to this now is that I may suggest to the profession the importance of the utmost care of the deciduous teeth. If they become so diseased at any time as to interfere with mastication to a sufficient extent to arrest assimilation or nutrition, a permanent injury is done to the system and life is thereby shortened.

Dr. JUDD: As far as I heard the remarks of Prof. Taft I am led to believe that he put forth some doctrines that we have been accustomed for the last fifteen or twenty years to hear, and undoubtedly defended them with as much ability as any one could well do it; but I was more particularly interested in this question from the confession that we needed something more than we had twenty or fifteen years ago, in order to explain the phenomenon which we witness in this carious action. I never felt satisfied entirely wtih the theories that had been put forth at that time. I do not wish to say that I have been entirely satisfied at the present time with any of the theories that have been put forth; but I was always in hopes that we would have something that would lead us to a theory that will be more acceptable, more probably true than the theory which is put forth by Tomes, for instance, or by Harris.

With regard to the vital theory I would state one fact. Take a tooth that has been extracted, and take off the crown and reinsert it in the mouth upon an artificial plate or upon a pivot and we find carious cavities developed in these crowns of teeth, essentially the same in all particulars as those that are developed in the living teeth. I am not going to deny but what the vital force that we have talked a great deal about, and which we know but very little about exerts some influence; but the fact is sufficient for our present purpose to know that caries takes place in dead teeth, essentially in every particular as it takes place in the living teeth.

I have no doubt but what the experiments of Dr. Watt in this direction were valuable. I have no doubt but the acids of the mouth have a very great influence in engendering decay. I do not wish to throw any discredit upon his experiments at all, but what I wish is more. You take a tooth out of the head and place it in an acid fluid 98° Far. I want to ask any gentleman if he has seen carious cavities produced there with the peculiarities of the carious cavities that we constantly see in the teeth. I have tried it several times and have found that it produces a general effect over the surface of the teeth. I do not find any hollowing out and a penetration down to the pulp cavity. I am not satisfied to lie down and close my eyes satisfied with the theories of our fathers, and attempt to find out nothing more about it. I am

satisfied that we have discovered one agent that has some influence here, the parasite. There are very few microscopic observers in this country that are capable of examining this question and determining whether there were spores or *leptothrix buccalis* there or not. The examination may have been with an inferior instrument, or may have been been made by men who were not acquainted with the appearance of the parasite. We have the evidence of the best microscopists in the world—men of world-wide reputation, who have declared that almost invariably where caries does take place, of the penetrating kind, a proper examination reveals the existence of these parasites and parasitic germs.

It may be asked how do these act. I cannot tell you how. It has been stated by some observer that when the germ is developed, and the germ is found within the dental tubuli, there is a distention of tubuli. It may be there is a simple distention of the tubuli, allowing the acids of the mouth to reach one part of the dentine much more easily than it does any other part, or it may be that they exercise an immediate influence themselves upon the soft tissues, for in dead or living teeth I want you to under stand that there is almost exactly the same amount of soft tissues in the teeth. Again it has been surmised by some that it is through the influence of these parasites that the acidity of the fluids immediately surrounding them is increased. This I think is a very probable theory.

REPORT OF THE COMMITTEE

ON

DENTAL CHEMISTRY.

By H. A. SMITH, Chairman.

THE past year has not, so far as your committee are informed, been prolific in research or original investigation in the department of dental chemistry.

It would indeed at first glance, seem that but little had been accomplished, or definitely settled in this branch of dental science. But when we reflect that original research in a science like chemistry requires a severe and special training, coupled with a fondness for the pursuit, and the command of considerable time and means for experimentation, and when we consider also that dental science, is as yet a new born science, we can but congratulate ourselves, that so many practical applications in dentistry have been made, which are based upon, and the direct result of discoveries by men in the profession, of the scientific facts and principles upon which they rest.

It is true in our own as it is true of all departments of science and art, that principles and discoveries have from time to time been announced, which have seemed chimerical and of little or no practical value. No hasty judgment however should be passed upon these discoveries, for some of them at least, have been made in the true spirit of scientific inquiry, and may yet lead to results of great importance to mankind.

It is a singular fact too, which holds true of dentistry, that these practical applications are usually made by others than the original investigators. A striking instance of this occured in the

discovery of chloroform by Liebig, in 1834, but it remained long after for Simpson to apply it to the relief of human suffering.

And so of nitrous oxide, the anæsthetic properties of which were first discovered by Sir Humphrey Davy. But no application of the discovery was made until one of our own profession, Dr. Horace Wells, many years after, made the first practical demonstration of anæsthesia by this agent on his own person, by having a molar tooth extracted, and at the same time proving to the world the feasibility of anæsthesia.

To Prof. Judd we are indebted (since our last meeting) for the translation from the French of a paper by Dr. Vergene, entitled, "Of Dental Tartar and its Concretions."

This thesis is valuable to the dental student, not only for the original analysis of dental tartar which the author has recorded, but also for the examination of each of the salivary fluids, and the grouping together of the several views of physiologists and chemists as to the character of these fluids, and the changes which they undergo in the mouth induced by certain forms of disease.

It will be remembered that at a former meeting of this Association Dr. Chase offered a paper upon the saliva, in which he stated that "the *chemical reaction* of fresh saliva is found to be in the human species nearly always acid or neutral." Dr. Vergene, after giving the observations of a number of experimenters, says: "In view of these facts we are enabled to state that normal saliva is alkaline, since alkalinity exists while the gland is performing its function. If the saliva is acid it has begun to undergo a change. During repose of the salivary glands the mucous coverings of the mucous membranes, and the *debris* of the alimentary substances, enter into the formation and form acid products, such as lactic acid, butyric acid, and others, according to the aliments which are soluble in the saliva, and they give it acidity. It is easy to understand how this acid saliva, before being neutralized by the alkaline saliva at the moment of its flow, might form, by its mixture of the two fluids, a third saliva which would be neutral." As to its alkalinity or its acidity, according to the researches of Robin, "no affection can render it acid while it is flowing from the gland. The acid reaction is due to changed buccal mucus."

Dr. Vergene defines tartar, usually, as a yellowish-white deposit forming upon the teeth and adhering strongly to them. It is of a phosphatic calcareous nature, concrete, unctuous upon its free surface, and it may acquire a great density. The color of tartar is variable. It is sometimes a green color, attributed to chlorophylin, which it retains in its substance. At other times it is a more or less deep brown, particularly upon the internal surface of the teeth. That this tint resembles tobacco or soot is not surprising in smokers, and in those people who have more or less scorbutic gums; but as it is met with without these etiological conditions, we must suppose that this coloring matter is not furnished by the carbon of the blood alone. It is probable that its origin is found in the sediment of the saliva or in the food. In certain subjects tartar has a slate or blueish or blackish color. This is usually given to it by the sulphuret of lead, sometimes of copper, and even of iron. In children the deposited tartar is, in some cases, yellow from saffron. Tartar shows under the microscope, when dried, cavities of a polyhedric form. These cavities, in tartar taken fresh from the subject, are filled with mucus mixed with *debris* of aliments, or they are alive with vibrios.

Acetic acid attacks tartar slowly, by displacing the carbonic acid of the carbonate of lime. Citric acid softens it; hydrochloric dissolves it; while a solution of potassa renders it more friable.

ANALYSIS.

Dr. Vergene made two distinct analyses of tartar taken from the incisor and molar teeth. The following is the result obtained by the second analysis:

	Incisor.	Molar.
Loss (organic material, water and alkaline salts,)	24.69	24.40
Phosphate of lime	63.88	55.11
Carbonate of lime	8.45	7.36
Silica	0.21	0.37
Phosphate of iron	2.72	12.72

In both analyses it was shown that the phosphate of lime is found in much greater quantity in the incisor tartar, while the phosphate of iron dominates in the molar. These results are opposed to those obtained by some other experimenters.

The phosphate of iron, as well as silicon, are always present in tartar. The large proportion of silicon found in the tartar on the molars is explained by the presence of silica in the parotid saliva.

This author, after giving the different theories upon the formation of tartar, concludes as follows: "Tartar results from a change in the saliva and of the gingivo-dental deposit, of which the latter is decomposed or hastens the salivary fermentation. The deposit of tartar is formed uniformly upon each tooth, but there are two points in the mouth where this deposit may be pronounced sufficiently to constitute concretions of tartar more or less voluminous. The seats chosen for these concretions should be attributed to mechanical causes. The composition of tartar varies with the subjects. There is always a difference of composition between the tartar of the molars and that of the incisors.

During the past year Dr. G. V. Black, of Illinois, has been conducting a series of observations and experiments to ascertain the causes which produce the various colors observed in carious teeth. The results of these researches have not yet been given to the profession, and, upon request, he has kindly furnished your committee a statement of his labors and deductions in this direction. We invite your attention to a summary of his paper:

Dr. Black first calls attention to the fact now generally admitted, that decomposing animal matter is darkened in color during the progress of decomposition. This is effected by the formation of sulphuretted hydrogen, which then precipitates any metals that may be in the solution in the form of sulphurets. Some of these are black and insoluble in the menstruum of the decomposing mass; whence arises the change of colors.

Now, when we come to examine the elements and combinations found in the mouth, it is easy to conceive that the insoluble sulphurets may be found there also, and that they have to do with the color of the decay of the teeth is highly probable. For example: in those cases in which the death and decomposition of the pulp occurs, without apparently any external opening to the pulp chamber, we have the same tendency to the formation of insoluble sulphurets that we find in decaying flesh elsewhere; and it is but natural that these sulphurets should tend to block

up the dentinal tubuli, giving rise to the darkened color which we observe. In time, after repeated infiltrations of coloring matter, the tooth may be rendered almost black. In the ordinary cases of decay, we do not have, seemingly, exactly the same tendency to the deposit of sulphurets. But when we remember that in the mouths of most persons there is formed at frequent intervals sulphuretted hydrogen—often in large quantities—and also that there is introduced with the food and drink an abundance of the metalic elements, especially in animal food, which is so prone to a lodgment between the teeth, there to undergo rapid decomposition with sulphuretted iron as an ultimate product, which, in turn, may give color to the caries of the teeth. The presence of iron in the mouth may be due also to the fact that the blood, and every secretion formed from it, contains traces of iron. It is present, as well, in the soft tissues of the mouth, and it has been stated to be a constituent of the teeth themselves.

Reasoning upon this state of facts, Dr. Black was led to make some experiments, which he describes:

Teeth were subjected to action of hydrochloric acid of such strength that the lime salts were not removed entirely from the teeth. The solution being transparent, and the remains of the teeth white, sulphuretted hydrogen gas was passed through a tube into the liquid. This had the effect to change the liquid to a yellowish color. The color of the teeth, after a little time, was changed to that of the liquid, and to a depth corresponding to the action of the acid upon them. The color corresponded very nearly to the light yellow color observed in carious teeth. In another similar experiment, the solution of acid was slowly neutralized by soda, while the sulphuretted hydrogen was being passed through. The color gradually grew dark, until the solution gave a decidedly alkaline reaction, when the precipitate was decidedly black. When ammonia was substituted for the soda, the color produced was blue-black. By varying the intensity of the acidity and alkalinity, he was able to produce all the colors of decay in teeth observed in the mouth. It was also noticed that if a solution of a tooth was rendered alkaline by soda or ammonia, without the presence of sulphuretted hydrogen, a perfectly white precipitate was thrown down. This fact may serve to explain

+) do not see how natural [illegible]
fact. If there is a [illegible]
[illegible] be true; but [illegible]
their full [illegible]

the formation of the so-called chalky spots upon teeth occasionally met with.

The reagents used in these investigations were not tested for iron or lead. But since the object of the experiments was not to test for the presence of the metal in the tooth itself, but rather to ascertain if parts of a tooth acted upon by an acid would give lodgment to, and partake of the color of, these sulphurets, it is probable the reagents employed were not sufficiently impure to affect the result.

It was observed that the shades of color produced in acid solutions were lighter than those produced in the alkaline. The length of time in which the deposit was being formed also modified the color: a slow formation producing the darker varieties, and the more rapid the lighter colors.

It does not follow, as may be supposed because these colors are produced by sulphurets, that all decays would be black. Take for example, a crown cavity in a molar, in which the degree of acidity is marked and the decay progressing rapidly; the coloring matter would be washed away as fast as formed with the softened mass, excepting at the margins of the cavity, where the action on the tooth bone is slower. In those cases of decay denominated stationary, we find them very generally black. The parts dissolved by the agent of solution are washed away, and those parts but partially acted upon, are blocked up and filled with the coloring matter.

It should be stated that peculiar varieties of color may arise from the lodgment of coloring matters, of either vegetable or mineral extraction, which may form in the mouth; but these must be regarded as exceptional, as all the common gradations in color may be formed by the lodgment of sulphurets.

Dr. Black, in studying the action of dilute acids upon the teeth, was led to suppose that vibration or rapid motion might modify their action. Accordingly, an apparatus was devised by which he was enabled to keep the solution in constant motion at the rate of one hundred feet per minute. The strength of the solution used was one part of hydrochloric acid to four hundred of water. In this was placed two perfectly sound bicuspid teeth with their approximal sides together, and adjusted in the relation to the current so that it would strike against their buccal

surfaces, but obliquely, so that the current would be changed from its course before it passed between the teeth. The teeth were subjected to this action for six days, and the result carefully noted each day. After twenty-four hours the points of their cusps were cut away almost exactly as in abrasion, and a slight groove was observed between the teeth just below the point of contact. The surfaces of both teeth were left smooth and hard.

On the third day the cusps were gone, and the groove between the teeth had extended into the dentine. The enamel was being cut away from the side from the current. On the fourth day a hard spine was noticed, which evidently contained the slender buccal horn of the pulp. The opposite horn of the pulp was exposed. This appearance would remind one of the phenomena referred to as the effect of vitality to prevent exposure of the pulp. A little later this hard spine had disappeared, and the pulp was exposed at the point where it stood.

Fifth day: The cutting continued from the crown and groove between the teeth. The enamel from the palatine surface is wasted to about one-third its thickness, and a close examination of the buccal surface showed that it had very slightly diminished. The edge of the enamel all around the buccal surface is elevated, coming to a sharp edge above the dentine, which is cupped out; but around the palatine surface it is rounded off, and does not rise above the dentine.

Sixth day: The acid was at work in the pulp chamber, and the crowns were going to pieces generally, when the experiment was discontinued.

It should be noted that the cut surfaces during the entire experiment were left smooth and hard, as in abraded surfaces. When the acid entered the pulp chamber the same softening manifested itself that we find in the ordinary experiments with the acid solution in the quiet state.

During this experiment a tooth was kept in another portion of the same mixture, but without motion. This showed nothing more than the usual slight softening. A number of similar experiments were tried, and in every instance the cutting was least upon the surface placed fairly against the current, and most where it broke around the tooth. The softened condition was only shown where the current was nearly or quite suspended.

The action of acids usually supposed to be in the mouth is that of simple solution of the phosphate of lime, which still maintains its distinct character as a phosphate, as salt dissolved in water retains its character as salt. It is not a chemical action in the same sense as that of a solution of a metal, which is resolved into a chloride, nitrate, etc. The reason why a tooth may be disintegrated by a weak solution of an acid at certain points, while other points are not affected, is not easily explained with our present knowledge. An understanding of this subject requires a better knowledge of that peculiar force which may be termed *surface attraction*, or surface condensation, by which a gaseous or liquid substance is attracted and adheres to the surface of a solid.

Almost all liquids are more or less strongly attracted to solid surfaces. As an example: if a glass rod is plunged into water, it will be found on removal that a film of water adheres to it. The water is attracted to the glass with greater force than its molecules to each other. It may be shown that it is possible for one liquid to be attracted to a certain solid with greater force than another, by passing a rod of iron, which has been previously wet, into an emulsion of oil and water, and, withdrawing it, we find only oil on the surface. The water has been displaced by the oil. These differences in surface attractions are not so readily demonstrated with the miscible liquids, but there is but little doubt that it exists. If we dip a tooth in either water or acid it brings away a film; but the film of acid is more difficult to wipe away than the water. The attraction is stronger, and consequently it adheres more closely. If a tooth is dipped in a solution of acid and water it will, of course, bring away a film of both; but whether either exists in greater proportions as compared with the solution, is not readily determined. Experiments indicate, but do not prove, that the acid suspended in the liquid is gathered to the tooth in greater proportion than the water.

It was this line of experiment that led Dr. Black to make those already mentioned, with acids in motion, under the supposition that if a condensation of acid took place, the motion of the fluid would tend to prevent it upon those portions of the tooth washed by the current, while it would be manifested by its action upon those portions not so washed. And notwithstanding this

peculiar cutting from the cusps or sharp angles of the tooth, which may be regarded as simply a physical modification, our experimenter is convinced that it is highly probable that this will prove to be the true explanation of decay, and at no distant day caries of the teeth will be artificially produced, and its *modus operandi* explained.

There is great need of an intelligible explanation of some of the phenomena presented in this disease, if we accept the acid theory of decay. As an example: the exemption of the anterior teeth in the lower maxilla from caries, which we so often observe in cases where the other teeth are more or less attacked; also, that a tooth should be carious upon a surface where there is seemingly no physical defect, and not upon another surface equally exposed to the action of the corrosive agents, are stumbling blocks in the way of accepting this hypothesis as the cause of dental caries.

Dr. Black, it would seem, has a clear apprehension of the difficulties which surround this subject, and has earnestly set about to discover, if possible, an explanation of that which is obscure in the causes which induce dental caries.

It is to be hoped that he will continue his experiments and researches in the direction already begun, as we feel confident they will command the careful attention of the earnest student of dental histology and chemistry.

The action of the coloring matter in red vulcanite—now so largely used as a base for artificial teeth—upon the parts of the mouth with which it comes in contact, and also its effects upon the general health of individuals wearing it, is a subject that has, from time, to time attracted the attention of, and been discussed by, the dental profession. Though regarded as a pathological question, it is, perhaps no less a chemical one, and may properly be considered in this connection.

A reference to the published statements and opinions of the profession regarding its use would indicate that there are two views held, directly opposed to each other.

The few who do not use red vulcanite in their practice, regard it as highly injurious, and claim that they see a diseased condition in nearly every case where it is worn. On the other hand, the larger number claim that it is an inert substance, and that evi-

dence is wanting to show that it has any deleterious effects, except, perhaps, in rare cases of a peculiar idiosyncracy.

Vermilion, as you know, is the pigment mostly employed to give color to the red vulcanite. The amount introduced to accomplish the object would give a proportion of nearly 36 per cent. of mercury as compared to the whole mass. Vermilion is a compound of six parts by weight of mercury and one of sulphur, in the form of a sulphide, which is insoluble in the mineral acids and caustic alkaline solutions. Nitro-hydrochloric acid, however, will decompose it.

There is one fact in connection with the manufacture that is worthy of note. In spite of all precautions, it sometimes happens that the mercury "flours," and, as it seems, every minute globule, is coated with a thin layer of sulphide. This condition, together with the well known action of light upon vermilion, to turn it dark by decomposition, the tendency to which is increased by the presence of impurities, may explain the presence of free mercury in the mouth; the little globule being liberated by friction on the plate whilst in use, and the action of light freeing the metal by decomposition.

The quantity of mercury which may be freed in this manner would hardly be sufficient if taken in a compact mass, to produce the usual physiological effects of mercury.

But instead, we have it introduced into the stomach in a finely divided state, which greatly facilitates the production of chlorides to which the active effects of the metal are due; these chlorides being formed by the chlorides and free hydrochloric acid of the stomach.

Some of the cheaper varieties of vermilion are adulterated with red lead, penta-sulphide of arsenic and other impurities, and to these agents, no doubt, may be traced some of the poisonous effects observed.

In studying the physical properties of vermilion, some five or six varieties of American, English and Chinese manufacture were subjected to microscopic examination with a magnifying power of 80 diameters. No essential difference was observed in them, excepting in the relative size of the crystal, which in the American variety was much the largest. In all the specimens examined there was observed numerous grayish white

globules, resembling free mercury. It is probable however that this appearance is due to an amorphous modification of the crystaline form. These were most numerous in the American manufacture and a variety called "Triste".

In our investigations of the causes which induce the symptoms of salivation, which it is claimed are so often observed by persons who wear vulcanite, it should always be made a matter of inquiry, if the patient has not within a recent period been under mercurial treatment. For it is well known that even severe salivation does not of necessity prove that mercury has been recently administered. It has been shown by Melseur's researches that mercury may for a long time stay in the system forming insoluble compounds, it is supposed, with some of the organic products of the body, and then suddenly manifest itself after the administration of the iodide of potassium for example, which loosens it so to speak, from its compound; and if the quantity is sufficient, all the effects of ptyalism are produced. Piggot relates a case in which a patient was violently salivated five months after taking mercury, by the use of iodide of potassium.

The difference of opinion and uncertainty as to the propriety of using red rubber for dental purposes, which exists among the dental profession, reflects little credit upon a body of men whose practice they claim is based on scientific principles. If this compound affects injuriously the health of our patients in any degree, it is clearly the duty of the profession to at once abandon its use. And if our Association should institute an investigation of this subject, whereby the doubt which surrounds it would be cleared away, it would relieve the apprehensions of many conscientious practitioners, and also confer a benefit upon the public.

In concluding this report your committee can but express the hope that ere long dental chemistry will receive that attention which it demands as one of the branches of a thorough dental education.

There is much that is obscure and uncertain in the etiology of those diseases which the dentist is most frequently called upon to treat, that it is highly probable can only be made intelligible by chemical investigation aided by the microscope. Before we can hope for much in this direction however, a taste for the study of this subject must be cultivated in our dental students, and this

can only be done by making the study of chemistry as attractive as possible in our dental colleges, by teaching in the laboratory largely, with experiments and practical demonstrations. The professors should have at their command ample resources, so that their laboratories may be supplied with the needed apparatus for illustrating both analyitcal and synthetical chemistry, as well as for the study of physics.

Teaching in this department should not be made secondary to any other pursuits; on the contrary, the teacher should be able to live by it, so that his best energies may be given to his duties as an instructor.

This means practically fewer dental colleges, and a higher standard of dental education.

In Memoriam.

WHEREAS, This Association has with sorrow learned of the death of Professor THOMAS B. HITCHCOCK, of the Harvard Dental School, one of our most valued members, and the Chairman for this year of the Committee on Histology and Microscopy; therefore,

Resolved, That we signify in this public manner our sense of the great loss which the profession and the cause of dental education has sustained; and that this resolution be inserted in the records in the place where the Report of the Committee would have appeared.

E. A. BOGUE,
J. TAFT,
L. D. SHEPARD, } *Committee.*

REPORT OF THE COMMITTEE

ON

OPERATIVE DENTISTRY.

By L. D. SHEPARD, Chairman.

YOUR committee will not be able to make a complete report upon all the questions of interest in this most important department of our specialty, and will not attempt to go over so much ground as some of your committees have in past years; nor will they enter at length upon details of practice which seem to them more appropriate to local societies than to a national body; but they will confine themselves mainly to the review, at some length, of a few topics which seem to them of great importance at the present time.

Considerable progress has been made during the two years since a report has been made to this Association, not so much in the bringing out of new methods and appliances as in the testing of the old, and in improvements in their construction and application, and in assigning to new processes their proper place and value. Most startling and suggestive of future changes is the rapid stride made by machinery for facilitating dental operations, within the past two years; the machines then in use have been improved and new ones presented. Their rapid sale shows that their introduction has met a universal want. While they have been used quite largely without judgment, and by the less skillful men, with lamentable loss of valuable tooth tissue and pulp integrity, they must be regarded as indispensable adjuncts to the hand instrument. We are doubtless but upon the thres-

hold of dental machinery, and shall soon see machines for purposes which have not yet been thought of.

The new engine just brought out by S. S. White commends itself to me as the best which I have seen, and yet this and all others lack, I think, two requisites for complete success. One is power independent of the operator. I consider the foot treadle in its most perfect form, as in the above named engine, as a great objection. When cutting live tissue at such approximation to the vital center as is often the case in excavating, no nervous force should be withdrawn from the object upon which we are operating, to be spent upon giving the power to drive the machine. Practice will make this deviation of nervous force so little appreciated as to appear almost automatic, and yet the truth remains that there is just so much force expended upon this part as is necessary to drive the machine, which could be estimated in figures, and in fact amounts to considerable in a day's work. Electricity has been tried, and has secured the endorsement of some men of good judgment, but cannot yet be regarded as a success, in giving power as well as speed. Steam has many objections, but they may be partially surmounted. I have seen an engine which may be driven by steam at five pounds pressure. This could be used in any building which is heated by steam. While this would be perfectly safe, still the very idea of steam as being a dangerous element will tend to prevent its general use for this purpose. Several water motors have been invented. One, the Backus water motor, which is a small undershot wheel in an iron case has been found very useful in driving sewing machines. It has also been applied as a power for driving dental engines. A photograph of a Morrison engine with this wheel in the place of the usual driving wheel has been sent to me by Dr. Brown, of New Jersey, which I shall be happy to exhibit.

Dr. Fisk, of Massachusetts, has combined several of his ejectors and so got sufficient exhaustion of air to drive a burr with the requisite speed and force. In both of these water motors ten to twenty pounds pressure of water is demanded, and the use of the water is more than one gallon per minute. Experiments are making, and I trust will be successful, to produce a water engine

which shall be free from the peculiarities which have so far made such motors objectionable for dental use.

I have been much pleased with a motor called "The Universal Spring Motor," which gives even more power than either of the foregoing at no expense. The springs are wound up with ease in one half minute and will drive a large sewing machine twenty minutes. The appliance is contained in a box, less than a foot square, and can be used anywhere, an advantage over water or steam. I have confidence that in some such combination as this last when improved and prefected will be found our most generally adaptable motor.

The other requisite is a method of suddenly starting and stopping the burr, without withdrawing it from the mouth, independent of the power. There are times when we can, with safety, make but a few turns of the instrument and then must examine, or need to get the instrument into exact position before it is revolved. By means of a chuck or similar contrivance in the handpiece regulated by the thumb or finger this great end would be secured.

better, in hand piece

The tendency a few years ago was to the use of heavier mallets, or greater impacting force in welding gold. Though the heroic use of such instruments may be still continued by some of our best operators, there has been more recently a gradually increasing tendency in the other direction, which has been carried by some to the extent of simply rubbing down the added pieces of foil, by the slightest possible pressure.

Ivory points were introduced by Dr. Shumway, of Massachusetts, who claimed that with these instruments he obtained a perfect welding of the gold with very slight pressure, the less the better, and that the ivory points did not burnish the gold, thus interfering with easy welding, as did a steel instrument. My own experiments with this method have not been satisfactory, and from what I have seen of the clinics and results of the inventor himself I cannot recommend the method as one calculated to secure the best results. Dr. Fillebrown, of Maine has urged upon the profession a set of steel instruments with very hard points which he uses with light pressure, and a slight rotating motion with no rubbing. I have not acquired the skill to use these instruments in his way to my satisfaction, but the work

done by the inventor will bear critical examination, and has proved a success in cases that I have examined after two years of wear. I believe it is not claimed that there is any saving of time by this method, but that it is much more agreeable to the patient, with less danger of injuring delicate or frail enamel walls and edges.

A very novel and ingenious plugger has been invented by Dr. Dennett, of Massachusetts. It consists of a small serrated wheel fixed upon the end of a plugger, so as to revolve when passed over the gold. This instrument is not to be used in the commencement of the filling, but after some progress has been made, and in large or protracted operations; more pressure being needed than in some of the above instruments, and yet not much. The annealed gold ribbon or rope is put upon the gold and by successive rolling and folding welded to what has gone before. I can recommend these instruments and have found them most agreeable to the tired patient, and the tooth sore from protracted pressure or malleting. The result as shown by the after filing is a very solid and perfectly welded mass.

A very complete saliva ejector has been invented by Dr. J. E. Fisk, of Massachusetts, use being made of the old principle of the Gifford injector, which by a small current of water secures sufficient exhaustion to completely withdraw from the mouth the accumulations of saliva. This instrument is perfectly clean and noiseless and is to be used with or without the rubber dam. I would recommend this little appliance to any one who has water in his office.

I have experimented somewhat with a new preparation of platina foil which is now furnished in such shape that it can be used with nearly the same facility as gold, the welding being secured by coating the platina foil with gold on each surface. For restoring the contour in anterior teeth, the gray or tin color is more agreeable to the eye, and, other things being equal, this should commend it to us and to our refined patients.

A general increase of interest in the discussion of the comparative merits of cohesive and non-cohesive foils, has recently arisen as a result of an article by Mr. Fletcher, of England, arguing that it is impossible to make water-tight fillings with cohesive gold. Whatever may have been the results of the use of cohe-

sive foil in England, there can be no question that experiments in this country, after the manner of Mr. Fletcher, have proved that perfectly water-tight fillings can be made with cohesive foil. And further, I have no doubt but that this is true of the great mass of fillings introduced in the mouth, by the great majority of skillful American practitioners. It is equally true that multitudes of fillings are made which are not water-tight. Such always has been and always will be the result with any material. In discussing what can be done we must eliminate want of care and skill.

A discussion upon this limited view of the question will be of comparatively little utilily, and I do not propose to waste time upon it. But the question of Mr. Fletcher has done good, and when stated more broadly as an inquiry whether the profession in America has not the past five or ten years used too much cohesive and too little non-cohesive gold for the accomplishment of the great end in view, the saving of the largest number of teeth for the largest number of persons—when so stated, I think, it presents a question of deep interest to us as a profession, and of vital importance to the public as sufferers.

The conclusions of Mr. Fletcher have seemed startling to many, and under his leadership we have heard utterances which to the cohesive enthusiast have seemed rank heresy, from men who have been popularly regarded as in the foremost ranks of progressive operators. It would seem as though they had suddenly changed front and by a leap gone back twenty years. Were it true that such sudden conversions were common, we should have little respect for a profession whose theories and practices were built upon so insecure a foundation. The student of history recognizes no fact as more universal than that revolutions are not of mushroom growth, but are the outbreak of long pent up and slumbering forces that when once under full headway sweep away not only the abuses of the past but many a monument of heroism and virtue. Such I think has been the history of the introduction and almost universal adoption of cohesive gold and the mallet. The day is not long past when to advocate non-cohesive foil and hand pressure was to sign one's warrant of consignment to the realm of old fogyism. That a reaction was sure to come, no one familiar with the laws of change could for a moment doubt. That it should come without a sudden out-

break, but gradually, was much to be desired. It has not been generally known, till recently, that many, very many of our best, most active and progressive men have been for the past three to five years, working out this reaction in the quiet of their offices, as is shown by the fact that the gold foil manufacturers have been selling more and more of non-cohesive or so called "soft" foil, and less of cohesive (I do not use the term "soft" foil, as it is a vague term as generally understood.) These men have been thinking, working, watching, and except occasionally in public and in their class instructions have given no expression to their change of views, and were hardly aware of it, so gradual had been the process, till suddenly asked a startling question.

No one will deny I think, that the greatest discoveries or inventions of the century in our art are the rubber dam and cohesive gold. The great revolution in practice which has resulted from them attests their importance. All honor to Robert Arthur who made haste to spread broadcast to the profession his discovery of the cohesiveness of gold and his reasoning therefrom. All honor likewise to Dr. Barnum for doing the same with the rubber dam. Many men in the profession before 1855 knew of the cohesive qualities of gold. I have seen welded fillings which were inserted in Boston over thirty years ago. The gold was annealed in platina pans. The late Dr. Westcott claimed the discovery. But to Robert Arthur and to him alone belongs the credit of the discovery, from his proclamation of it in 1855. I do not know as any attempt has ever been made to take from Dr. Barnum the full credit which belongs to him. I give them all honor and my respectful homage. As a result of their lives the possibilities in saving teeth have been immeasurably enlarged. No man can do first class work without having at his command these two most indispensable adjuncts. Our societies and literature afford ample evidence of how happy the profession is in the possession of these means for accomplishing results which previous to their day were impossible. Almost all the clinics for many years have been devoted to the exhibition and elucidation of how to best use these materials, and secure the most beneficial results. Such clinics have done great good. The profession has been urged to adopt and has pretty generally adopted the maxim that time and cost are of no importance in compari-

+ Clark Bacon in 1847 [illegible] two qualities of [illegible] his Cohesive [illegible]

son with perfectness and beauty of result. I have sympathized with all my enthusiasm with this progressive movement.

During the past four or five years, however the question has year by year been forcing itself with increasing urgency upon my attention, what is best for the patient—by what method and with what material can his teeth be saved with the least expenditure of suffering on his part and of time or money? This important question implies that the interests of the patient are paramount to those of the profession, and should, I think, underlie our every effort, and accordingly as any method or material answers it, should it stand or fall. Let us seriously ask ourselves whether in our earnest striving after perfection of operations we may not somewhat have lost sight of it, and to a certain extent proceeded as if the patient had no rights which the dentist was bound to respect.

The filling of teeth with gold to-day is a much longer and more tedious operation than it used to be, say on an average twice or thrice as long. It is the common impression with the public that it is also a much more painful process. A part of the increased time and pain is no doubt the result of an appreciation of the necessity of more thoroughpreparation of the cavity, but a part is certainly the result of the different manipulation demanded by the use of cohesive gold. Can we spend an hour to better advantage than in discussing whether all of the added time and pain is absolutely necessary for the saving of the teeth. In introducing this question, I am I know treading upon dangerous ground where I very likely may be misunderstood or misinterpreted. Nothing is further from my mind than to advocate so called "cheap dentistry," and yet in passing let me say, that we shall deserve ere long to lose our position of good physicians unless we devise some way in which good cheap dentistry may be placed within the reach of the masses, or furnish, as a friend of mine put it, "dentistry for the poor, versus poor dentistry." To return to my point, every moment spent upon a filling which is not necessary in the salvation of the tooth and its restoration to usefulness, is mis-spent time, and the using of it a fraud upon the patient. In every unnecessary pang which we inflict, we violate our most sacred mission, and injure directly or indirectly our patient and all who are afflicted. I feel that as a result of the teachings and discussions of the past

ten years the tendency has been to this extreme, and that it is high time that some one should take his reputation in his hand and lift up his voice as a champion for the sufferers. We have well nigh run mad upon the rubber dam, cohesive gold and the mallet. There is no good thing in the world but can be abused, and these have been to a shameful extent, not by all practitioners by any means—some have not adopted them at all—I am sorry for their patients; but it is true, I think, of the majority, especially of those who have entered our ranks within the few years past. These have had no opportunity, or have not cared to learn anything else, as in the artificial department they know no plate-work but rubber. In our striving after the new we have left behind the good as well as the bad of the old. Our conversion has been too sudden and too radical to be valuable.

Our profession may be divided, as can all society, into three classes, without however any sharp dividing lines.

There is the enthusiast in progress who is ever on the alert to discover or learn of something new. This he adopts with eagerness, frequently with little or no investigation, the novelty of it being a sufficient reason. He adopts it in all cases, whether it is applicable or not, and thinks it the greatest improvement of the age, casting aside all of the old which is antagonistic to the new. Among this class are a few who with great faults and authors of much mischief, are the world's greatest benefactors. No reform, no progress can be achieved without their aggressive aid. The public are the gainers by their lives, their own immediate patients the sufferers. I admire them and am willing to follow them, but a great way off.

The other extreme are those who either from indifference to progress or complacent satisfaction with what is, neither investigate nor adopt anything new, but keep on in the old ruts, treading the paths their fathers trod, running no risks, and many of them doing excellent service for their patients, so far as they have the means; safe men, always to be relied on to do the same thing whether good or bad. Everything new is an innovation and hence to be ignored without question. They look down from their serene heights upon the reformers, and wonder how such insane men can get any recognition. These do more general good to their patients, doubtless, than the former class, but are

cyphers so far as advancement is concerned and of little benefit to and influence with the profession. We respect them as we do age, but are willing to leave them far behind.

The third class is between these two extremes and embraces, I think, the great mass of practitioners. These are interested in progress and yet more interested in the good of their patients. They investigate the new, make trial of it with caution and watchfulness, patiently awaiting the result, and do not cast aside the old until their trials have convinced them that the new is better than the old. Their progress is ever upwards step by step. Earnest men but quiet, and not over sanguine, attentive, receptive, forming the great impartial jury, whose verdict will stand the test of time. A great many in this large class do not answer to the above description so far as their personal investigations go, but they belong to it, as they follow close behind their cautious leaders, who are very numerous, and whom from experience they know they can trust.

I would most earnestly recommend to the general practitioner to enroll himself among this middle class, and to adopt as his motto, the well known aphorism:

> "Be not the first by whom the new is tried
> Nor yet the last to lay the old aside,"

The first class which I have sketched have been so aggressive and outspoken in their views that the impression has been conveyed that a man will lose caste if he acknowledges the use of non-cohesive gold to any extent, or expresses the opinion that there are many cases which can be as well filled without as with the rubber dam, or dares to doubt the truth of the maxim that the typal form is best and should be generally retained or artificially restored.

I have had, perhaps, unusual opportunities for observation and comparison of the results of what might be called old and new school practice, and as a result, during several years, have been modifying my practice. I will not take your time to state at length the reasons for my present views, nor to describe just where or when this or that method or material is, in my judgment, best, but will as briefly as possible, make some statements which are, I think, susceptible of proof.

First: That cohesive gold should be used only where from the nature of the case it is necessary to have the strength of welded gold. In all other circumstances I believe the safety of the tooth and the good of the patient are best conserved by the use of non-cohesive gold. I consider it established that non-cohesive foil fillings well introduced have been successful in preserving the teeth. If this is a truth, why abandon the use of it and subject our patients to an increased expenditure of time and pain to make welded fillings, except in the cases mentioned above where cohesive gold should be used in whole or in part. I believe further that non-cohesive foil is susceptible of more perfect adaptation to the walls of the cavity than cohesive foil, although with nice and slow manipulation, a sufficiently perfect adaptation can be secured with the latter.

Second: In regard to the rubber dam, from what I have heard from prominent operators, I judge that they use the dam in nine-tenths, or ninety-nine one-hundredths of their operations. To apply the dam takes some time, and is generally painful, sometimes to an extreme extent. When necessary, I believe heroic application of it, judicious and kind. But when a tooth can be filled without it, its use is injudicious and unkind; and has done a great injury also in keeping patients away, from their fear of it. There are different ways of applying it, and I think I give as little pain as any one by the use of thin rubber, and in particular by split surgeon's silk as a ligature, which insinuates itself, carrying the edge of the rubber before it, between the free margins of the gums and teeth, without compressing the soft parts; and yet I am free to acknowledge that I use it less than I did a few years ago, and I ask for our suffering patients that they may not be put to any unnecessary torture. As a general statement, I should say that the use of the dam is unnecessary and hence cruel in a large majority of medium sized cavities in the grinding surfaces of superior molars and bicuspids; in a great many cavities in the labial surfaces of superior incisors even when extending a considerable distance under the gum, also in proximal cavities in superior incisors when wedges are used, and to a considerable extent in grinding surfaces of inferior molars, in buccal surfaces of superior molars and in other positions to a still less extent. If you look carefully over this

list, you will find that it embraces a large proportion, perhaps a third, of all operations. I do not expect the young dentist, who never practiced anterior to the days of the rubber dam, will know how to do this, without special instruction, any more than I expect him to know how to do all kinds of gold plate work, but I ask him to take measures to learn of those older in practice who do know how, and I ask the older practitioners this simple question —cast aside all cases which are proximal or come near the gum, do you find that the work of ten or twenty years ago has failed to preserve the teeth? Have your stoppings in the grinding surfaces of molars decayed around or dropped out? Review the instruments you had then and consider the time these fillings took you, has our much vaunted progress been all upward? I will not take time to describe how such cavities can be kept perfectly dry, but I assert that they can be, and am willing to demonstrate it. I do not think however, one can succeed to the extent I claim, unless he can use the mirror in the way which I advocated before the Association two years ago.

Third: That the typal form is best and should be retained or restored is no doubt true in theory, but the attempt to carry it out in practice to the extent which has prevailed in some localities under distinguished leadership, has resulted in such numerous failures as to bring discredit upon our art. After a term of obloquy, judicious cutting away of carious teeth to remove thin edges and allow of proper after cleaning, has once more been recognized as the best practice by very many of our most careful observers. These, after fair trial of contour fillings, have given them their proper place as of immense advantage when the circumstances are such that there is an object to be gained in the restoration of contour, other than the mere theoretical one.

Another topic naturally suggests itself in this connection. It has been often said that any tooth which can be filled at all, can be and should be filled with gold. To this statement I take exception most emphatically. I think there are many teeth and some of them comparatively easy ones to fill, which a regard for the best good of the patient, as spoken of before, demands should be filled with other materials than gold. For example: I would recommend tin as more justifiable than gold for most cavities in the grinding surfaces of molars, when the antgonizing tooth

is gone and hence not subjected to attrition in mastication. The same material should be used in many proximal cavities in molars and bicuspids especially when they stand alone and have strong walls. I need not enumerate the gain in the time and pain saved to the patient, and the very low caloric conductivity of tin, its apparent antiseptic or corrective effect upon tooth tissue and so forth. Old practitioners know this is true, but such has been the frenzy for the beautifully polished cohesive filling that this material, second only to gold, has been swept into almost total disuse to the injury of the profession, and the defrauding of our patients.

Gutta percha, or Hill's stopping, under the stigma of the term "temporary filling" has not been given its proper rank as a most valuable filling for cavities in the buccal surfaces of inferior molars, especially the third, and other places, proximal cavities in the incisors of children.

We have here in tin and gutta percha the best weapons with which to lessen the amount, some ton and a half, of amalgam, which is used every year in the United States for fillings. I am not a disbeliever in the judicious use of amalgam, though I believe it sadly over-used, but some are, and I know of no way to arrest its immense consumption except by the advocacy of tin and gutta percha by our prominent operators.

There are many other topics, in regard to which the same course of reasoning would apply, but I have said enough I think, to stimulate discussion on this subject, which I regard as one of the most important for our high standing as a branch of the great healing art, the sanctity of whose mission has been endorsed by the Great Teacher's favorite assumption of the name of "Good Physician."

DISCUSSIONS.

Dr. SOUTHWORTH: Those parties who have been in the habit of using amalgams where they can be inserted rapidly will find great difficulty in using the amalgam pellets from the fact that they are so extremly dry. We all have patients who cannot or will not pay for gold and a great many think it is not fair that we should turn them off on hard amalgam.

Having experimented during the last six months I can give the component parts of an amalgam that contains much less mercury than the ordinary amalgams. I took nine grains of amalgam composed of 100 parts of silver and 110 parts of tin, incorperated it with ten grains of mercury, to make a filling large enough for an ordinary sized cavity, washed it and removed the excess of mercury in the ordinary manner, as dry as I possibly could, and in almost every case I found that I had 7½ grains of mercury as the result. I take my laboratory vice and press it out, and I prove conclusively by preparing my amalgam in that way, I have a proportion of six out of sixteen, or two fifths. Dr. Shepard said that the general run of amalgam was one-half.

In cases where the rubber dam cannot be applied without using wedges or filing, I found by taking a little toilet soap and moistening the edges of the cavities on both sides it will slip in between the two teeth.

Dr. CROUSE: The last time I heard a discussion on the subject of operative dentistry, was at Niagara. A very prominent college professor advocated a doctrine I did not like. It was the doctrine of filling molars with amalgam. As I have no amalgam to sell, and do not think very much of it, I am not going to discuss it, but I shall pass to the next topic of his report, machinery. He accuses bungling operators who are using engines of various kinds, of cutting away too much of the tooth. It is not a general thing that too much of the tooth is cut away. In my opinion it has been the failure for a great many years, that not enough of the tooth substance was cut away—the fissures are not cut out and

filled up to the end. That has been my observation ever since we have had machinery to do it with. He claims also that the electric machine is not a success. I have no electric machines to sell, but I shall stand up for them, having used one in the neighborhood of three years, as being far better than anything now in use, in my opinion.

I agree with the paper to a certain extent, at least in the use of soft foil. I never have liked the idea of adopting, universally, a heavy foil. I meant to have the author of the report define what he meant by soft foil. If he means entirely non-cohesive gold I do not agree with him at all. If he means soft foil that is partially cohesive, I agree with him as being much better than such very cohesive foil, for ordinary cases. If you do contour filling you have to use a heavy gold, and I know of no other gold so good as No. 60, 120 or 20, for that purpose.

I shall not differ from the author in the opinion that hand-pressure should be used more than it is; especially in chalky teeth, easily crumbled.

We now come to the rubber dam, and the class of teeth to be filled with gold. The author advocates tin foil in the crowns of molars where there is no antagonist. If there is no antagonist one should be supplied, so that there would be a full masticating surface; and I would not fill it with tin. If I prepare my cavity properly why not fill it with gold? It takes but very little longer, if any, a very little more work, and a very little more expense.

I also agree with the paper, that it would be a good thing when we can fill teeth rapidly and well, so as to bring dentistry within the reach of the masses, so that the poor can have cheap first-class dentistry. They don't have much now.

I claim that if the rubber dam is put on by a skillful operator, very little pain is caused, and it is pleasanter than the napkin. It is inserted with little loss of time, and after it is inserted you can see that your cavity is prepared properly, and that everything is right, working with that confidence that you cannot without it.

Dr. MORGAN: I rise to protest against the manner in which gentlemen use the terms soft and hard foil. The softest foil that is made is the most cohesive, and when men say soft foil and mean non-cohesive foil, they do not have the correct idea.

Dr. WETHERBEE: I agree with many things which the Chairman of the Committee has stated. There is incompleteness in the paper, however, as no mention was made with reference to the manner of filling the roots of teeth; what material is best to be used; and no mention was made with reference to the best manner of removing salivary calculus, the style of instrument to be used, etc. It seems to me that the report should have gone further; yet it may be said that time is wanting to cover the entire ground. The more difficult operations on which we should receive instructions should not be ignored, but should be well and faithfully dwelt upon. It may not now be in order to make any extended remarks upon these two points; I shall, however, utter my caveat against the declaration that labial cavities, and buccal cavities which extend under the gum to any extent, can be equally well filled without the dam as with.

Dr. SHEPARD: I did not say buccal cavities under the gum; I said labial cavities even when they extend some distance under the gum. I wish to make that distinction, which is very important.

Dr. WETHERBEE: It is a distinction without any material difference. It is very likely that the operator, if he exercises the best possible care, will bleed the gum. In very hard, firm gums that may not be the case, but in soft gums they are likely to be touched.

Is it true that a patient is incommoded by the application of thin rubber with a very thin twine, No. 58 or 60? I believe the majority of patients would much rather have a clean piece of rubber in contact with the lip than a napkin of proper thickness to prevent moisture from flowing down upon the gum and wetting the filling. After the cavity is prepared to a certain extent a small instrument representing the third of a circle of an eighth of an inch, after the dam shall have been applied, is placed under the gum, lying upon the dentine, below the periphery of the cavity. A slight sensation of course is experienced when this instrument is so placed, but of no particular consequence. Instead of attempting to draw the twine so tightly as to cut the gum, or press severely upon it, the twine is carried up over the instrument, which is held by an assistant, and drawn down very carefully, impinging, not very severely, upon the gum between

the teeth. The saliva is now completely excluded from the cavity. You can now proceed to finish the excavation of the cavity. Having completed this you commence the impaction of the gold by a small retaining point, which is carried forward rapidly from one side to the other in the upper portion of the cavity, until it is filled thoroughly and properly. The advantage of this dam is further seen in finishing off your filling, there being no laceration of the gum.

True some very inferior cavities in the buccal surfaces of superior molars may be very readily filled with pellets without the trouble of introducing the dam. They must indeed be small in size if you obtain the same perfection that you will obtain by the use of the dam.

When the mallet was introduced several years ago, I was so unfortunate as to write an article for the Cosmos, in which I gave several reasons why it should not be used. I thought however, before I should pass from the stage, I would make a third trial. I commenced its use first on ordinary cavities, and found at the close of the day that I was not as tired as when I used hand pressure, and only about one patient in ten would express a dislike for the mallet and prefer hand pressure. I continued to use the mallet, soon, however, dispensing with the one ounce wooden mallet, and using the five ounce and a half mallet. I rejoice that the mallet was introduced to the profession by Dr. Atkinson.

Very much has been said with reference to preparing and filling pulp cavities, and the material with which those cavities should be filled. It has been said that oxy-chloride cement is as good as anything else: also, that Hill's stopping, when it could be well deposited in the root, was as good as gold. It is my opinion that there are very few gentlemen who have so carefully studied this matter as to be able to determine that these two materials are nearly as good as gold. I believe that as gold is superior to either in crown, proximal or labial cavities, so also is gold superior to either in the roots of the teeth.

Dr. REHWINKEL: Under all circumstances?

Dr. WETHERBEE: Under all circumstances, whether it rains or shines, blows high or low. It is said as an objection to the use of gold, that it is more difficult to fill the cavity with gold.

Be it so: then you should educate your head and your hand, so that both will be equal to the task. The professional man should know no defeat where it is possible for intelligence to gain a victory. Gold can be carried where nothing else can be carried, with a certainty and positiveness of which you have no knowledge concerning the other operations.

Again, gold is preferable in the roots of teeth to oxy-chloride, not preferable to a filling of Hill's stopping that is positively perfect.

With reference to the removal of salivary calculus from the teeth, of which nothing was said in the report, I believe that the subject is neglected in some quarters; not that there is any gentleman here who does it. It may be well to remind you that we should be diligent in our search after salivary calculus. It has done serious injury, and is doing serious injury to-day, from the fact that it is overlooked. There are, as a general thing among the profession no well constructed instruments for its removal, therefore they fail often in diagnosing cases to reach to the extent of it, and if they are aware of its still further extension they are unable to reach it for the want of instruments therefor. It seems requisite, therefore, that the subject should receive more careful attention and consideration than it has heretofore received.

Dr. THOMAS: I rise simply to express my entire approbation, with some very slight modifications, of the report of the committee upon this subject. When a child has been placed upon low diet for any length of time and then has access to the good things of this life, he is very apt to go to excess; his appetite will lead him away. I believe that any operator in general practice at the present time, who has had placed in his hands the facilities for operating that we have had for the past ten years, will quite agree with any one that should make the assertion that we are really in advance of the past, in perhaps, more than a hundred fold ratio.

So far as the report upon this matter of operative dentistry is concerned, I believe if every gentleman in this room were to take the report and analyze it, and take it up sentence by sentence, or in other words subject by subject, as they were presented, he would quite agree with it. I have no interest in the

report, nor in the gentleman who presented it, but I have within the past ten years seen the folly, I think, of a great deal of this progressive operating, as it has been called by many. Do not understand me, however, as implying that I would attempt to throw a wet blanket upon the progression of the present day.

I do not propose to discuss the modes of operating at the present day. I take it for granted every gentleman in the room is familiar with them; but I have felt for the past two or three years that I am just prepared to commence to investigate in relation to this matter of operative dentistry. Five years ago I was almost ready to exclaim that any man that did not use a heavy foil was very far behind the age, but when I see operations that were performed twenty, thirty and forty years ago with non-cohesive foil, with smooth points, by hand-pressure, when I see them good to-day, the teeth preserved, I am led to stop and consider whether we are perfectly justifiable in throwing aside all of these old appliances, these old modes of operating as they are termed, and at once accepting all of the new and progressive methods and modes as they come before us without a thorough investigation; and if we shall but take the middle ground that was so strenuously advocated in the paper, I believe that that will be at all times safe. Every one is apt to think that the appliances that he has been using for the past two or three years are the very best appliances. I have labored under that difficulty myself. I have felt that certain appliances that had come into my hands were the very best that could be made use of, and have advocated them very strenuously and very earnestly, but I think it is dangerous ground for us to take at any time, to denounce any old thing that has been used, and attach ourselves to any new thing that may come up, without a thorough and proper investigation.

The paper referred to the cutting away of the tooth substance. The author believes a great deal of tooth substance has been cut away that was non-essential. I fully endorse that. I have done it myself. I believe that a great deal more has been broken away and lost after the patient has passed from our hands by reason of too much force, than has been cut away at the time; but I believe we have been greatly at fault in both cases, and I also agree with Dr. Crouse when he states that we are greatly at

fault in leaving our operations before we have cut away enough.

We should, then, pursue a happy medium, in order that we may be able to produce the very best results.

Dr. BUTLER: It has been stated that there is more time spent than formerly, and objection was made to the amount of time. I doubt if more time is spent upon the same class of gold fillings. It is well known that quite a different class of operations is demanded at the hands of the profession now, than was twenty, or even fifteen years ago; so that if more time is spent it is an absolute necessity. There are many large compound fillings made of gold to-day, that a few years ago were not even thought of. The greater degree of refinement and cultivation there is among any class of people the more demand there is for fine work of all kinds. They must indulge in luxuries as well as necessities, and finely finished fillings and operations upon the teeth are absolutely demanded. It is also a fact that in the arts fine productions must take time. Finished pieces of jewelry require time to manufacture. The article can be wrought up into form quicker than it can be finished; so in putting in gold, the impactment of it is but a small part of the labor and the effort that is demanded to make a complete operation.

Another speaker spoke of the pain in applying the rubber dam. Dr. Wetherbee spoke of the use of thin rubber, but I do not see wherein it is superior to the thick. It causes more pain to draw it down and turn the edge so as to make it impinge tight upon the neck of the tooth than it does the thick; and I cannot see where it would cause much pain and annoyance to draw the thick rubber down. Those that have become somewhat expert in the use of the rubber can use a much thinner article and put it on securely so that it will exclude the moisture without any difficulty, by simply leaving a little more space so that the tension upon it will not draw it off and it can be turned down between the margin of the gum and the neck of the tooth with very little pain, but I believe it cannot be done as well as with thick. I do not believe time is wasted in putting on the rubber. A little practice will convince one it is not time wasted, but is time saved. Upon a certain class of patients I would not like to operate at all if I could not use the rubber, so that as a matter of security and health to the operator we should use the rubber.

Dr. Wetherbee, in speaking of the filling of canals, said that gold could be introduced more perfectly, and more thoroughly than anything else. I cannot conceive how you can take a substance that is not plastic and force it into the canals as well as you can some plastic substance. If these preparations are objected to alone, you can take a little coil of gold and carry it in with it; and it certainly does seem to me that it will force itself into all these little inequalities of the canal more perfectly than it is possible to force gold.

With reference to the use of different preparations of gold, I apprehend no rule can be laid down. Each one seems to be able to work that out for himself, although I can conceive where it would be advantageous to those that are seeking to know the best, to give something like a rule or general mode of proceedure, but to go on and detail just what class of cases could be best reached with cohesive gold and what with non-cohesive, is something which would seem to me unseemly in a body like this. It is well known as a general rule, that where there must be anything like a restoration of the crown, cohesive gold must be used, but this extra-cohesive I am not so sure can give us the best results. It is quite laborious to work, and the walls of the cavity are likely to be powdered and crushed a little, and the crystals broken up in the impacting of it, thus giving an imperfect work, with all our effort, whereas if the softer preparations were used it could be made perfect, or not break up the edge so as to spoil the whole thing in a short time.

I am not familiar with the use of what is called heavy gold, not being in the habit of using anything beyond No. 60. If I were to be confined to one preparation I would prefer No. 30.

Dr. KNAPP: I have been very much pleased with the report on operative dentistry read by the Chairman of that Committee. It is a document very worthy of our consideration. It commends itself to us from its candor and from the truthfulness of its statements. It is very easy to criticise a report. Anybody can state that a report has omitted certain important points and that in every particular it is not exactly right, in accordance with their views and notions. Let those who thus criticise a report try if they can make a better one.

I commend the report wherein the author asserts that there is

at the present day, far too much cohesive gold used, compared to soft gold. He advises the profession of this fact and states to them that more good can be accomplished by using soft gold in a very great variety of cases. The author of that report neither advises nor disparages the use of cohesive gold. It is certainly a good thing in its place, but I disapprove of the indiscriminate use of it. It is patent to you all that cohesive gold requires a greater amount of force, and greater pressure must be given upon it in order to adapt it to the walls of the cavity than is the case with soft foil. Hence we may more safely use the latter in cavities where the decay had been very extensive, rendering the walls too frail to admit of the greater force required upon cohesive gold.

It has been shown that it is not the amount of gold that can be put into any cavity, that is essential, in order to preserve teeth. It has been shown that there is a certain degree of hardness and density which need not be attained. I see young members of the profession about me cheering and clapping when some one of their number makes an assertion that no man can do fine work or perform excellent dental operations, in the way of filling teeth unless he makes exclusive use of cohesive gold foil, the mallet and the rubber dam. It seems to tickle them very much when these strong assertions are made, proof of which is not given. I would not disparage cohesive gold, the rubber dam nor the mallet; all of these are good in their place.

Dr. Crouse appeared to differ from that part of the report relating to the filling of certain cavities without the use of the rubber dam, making the assertion that it was utterly impossible to fill cavities therein described in anything like a perfect manner without the use of the rubber dam. I think when the gentleman gives the subject a little further reflection, when he comes to a knowledge of the fact that should be before him, that very excellent operations have been performed by a number of operators in the profession without the use of the dam, in the cavities indicated in the report, he will see the error of the assertion which he made. The report you recollect was moderate. It was expressed in mild terms, and took a medium ground. The author of that report did not tell you that the rubber dam was not required in certain cavities. He specified those in which, in

his opinion, it was necessary, and he deprecated the use of it where it was unnecessary, saying that the length of time required was one objection, and the pain and inconvenience to which the patient is put were objections to the use of it, where it is not actually needed, and wherever it can be dispensed with he recommended that it should be avoided. Why put the patient to unnecessary time and inconvenience and trouble in using it indiscriminately in all instances in filling teeth?

The use of machinery was spoken of in the report and the author coincided with my views. He states that it is resorted to too frequently, especially by members of the profession who are unskilled in its use, and who are careless in employing this very effective agency in cutting out the substance; and the assertion therein made that too large a portion of the tooth substance is cut away by the use of machinery, which renders its decay more rapid, is certainly true; wherever there is a large amount of tooth substance to be cut away and it is of a hard character we certainly are warranted in using the burring engine, a very excellent thing for that purpose.

The additional time and the additional pain and expense, in my opinion, incurred by operating after the manner that is recommended by the extremists of the present day, do not warrant us in resorting so indiscriminately to the use of these modern appliances.

Dr. JOHN ALLEN: I have been exceedingly interested in many things that have been said. I was very much interested in the report upon which our discussion is now pending. That report I think dealt very fairly with the subject, and I could not help comparing the state of our profession as it was forty-five years ago with what it is to-day. I almost wonder that as good work was made then as was made. When I look at the various modes that are urged as the best, the different preparations of gold which are better than any other, it calls to my mind the remark of the old German who said it made no difference which road they went to market if the *wheat* was good. That is the great point; if our operations are good, it don't make so much difference which way we go to get them.

The balance of testimony, I think is in favor of soft gold, nevertheless very good fillings were made many years ago, be-

fore these fine distinctions as to soft, hard, and crystalized and all those different kinds of gold were as clearly known as now. I can look back forty years and call to mind many fillings that were put in then, that are yet doing good service. Then we had not the appliances that we have now. Then we did not have the fine manufactures of gold that we have now. There are a great many outside of our profession who have aided us materially in getting up various devices in the manufacture of various materials, the manufacture of gold, and teeth and the various implements now employed. The dentists seem to claim all the credit of these appliances, not giving credit to those to whom we owe them originally.

There is no doubt that dental science has never stood as high as it does to-day with one exception. In the artificial branch of our profession I think there has been a retrogression rather than an advance.

Dr. KEELY: I wish to take exception to one statement made by my friend Dr. Knapp. I understood him to say that with soft foil and hand-pressure there was less danger in packing against frail walls than with cohesive foil and the mallet; my experience is that we can with heavy foil and with the mallet pack to these frail walls with a greater certainty, ten to one, of not breaking them away, than we possibly can with the soft foil. We cannot only pack it more perfectly, but we can lap the gold over the frail edges and protect the enamel. I do not pretend to say that good and permanent fillings cannot be and have not been made with soft foil. I remember when I was in the office with Dr. Allen he called me to look at a filling in a gentleman's mouth; you may imagine my astonishment when he told me that filling had been there forty years. It was a good filling and if he had told me he had just put it there I would not have been surprised.

Dr. KULP: I occupy a peculiar position in this country where I can judge of the results of operations of many operators. I see more operations coming from the hands of different men, and representative men of the profession than almost any other man in the profession. Most of you send your patients west, and instead of going all the way east to have their dentistry done, they come as far east as where I live. I have been thinking over,

since I have been sitting here, how many fillings I have seen within the last year, that were put in by men who are present to-day, and I think I can count twenty-two, and they are mostly representative men. I want to give my opinion as I have based it upon what I have seen as to the results of these operations. I find those who use the rubber dam and have used it from the begining, and those who use the heroic practice of dressing out cavities, cutting away all the frail portions, and filling with cohesive foil are the ones whose fillings show the best, whose teeth are best preserved. In a mouth recently I found seven fillings from the hand of a beloved brother; five of those were very good, and two were poor. That man does not use the rubber dam, nor cohesive foil. He failed in two cavities, because the walls were frail, and it was impossible for him to pack the gold as he ought to have done. I do not find this so, coming from the hands of those who adopt these modern modes of practice.

I have one word to say upon this subject of vacillating; I mean to-day taking No. 60 and tomorrow No. 120, to-day soft, and tomorrow cohesive foil. I believe that is the wrong way to practice dentistry. I have now adopted the plan of sticking to one thing. I believe in following that particular plan; by finding out how we can have the best results and sticking to it, we can always have uniform results. Upon this subject I would most cordially recommend an essay that was read by Dr. Leslie at the Missouri Dental Association last March, because it accords with my own experience most thoroughly.

My own experience is that the rubber dam is a great deal less objectionable to patients than the wedge, and much more acceptable to the operator. While I do not recommend that the rubber dam be used exclusively I would generally say use it.

Dr. REHWINKEL: It is strange that all our discussions, all our arguments now seem to tend to a caution to guard against the abuse of good things rather than the judicious use of them.

If Dr. Shepard, the author of the paper under discussion, has given, in some instances, his individual views and opinions on some methods of practice, they have been expressed in such a way as to leave always the liberty to every other practitioner to do as he pleases, without injuring his status in the profession.

After all, these different modes of practice must necessarily be left to individual discretion.

When we look upon the matter and ask ourselves whether some of the operations can be performed without the rubber dam, some of the older practitioners who have had practice in that way could give us a satisfactory answer. There are many in the room who will say, it can be done and it has been done, but those who have been compelled to do it without the rubber and can now use it, would not think for a moment of doing it without it. I have been compelled to do these very operations without the rubber, and the trouble and mental anxiety and nervous irritation and worry of keeping that miserable little cavity dry has been ten times the trouble of excavating and filling it five times over.

The only objection to the rubber is that it secures the teeth so well and puts the operator so perfectly at his ease that he will be very apt to keep the patient sitting in the chair with the rubber over his mouth, and go into the next room and chat with a patient half an hour!

In my opinion there are young men now brought up in the profession who could not begin to fill a tooth without rubber, or with non-cohesive gold. The preceptor who will allow the student to go out of the office without having him perfect, not only in the use of non-cohesive gold foil, but in the method of filling teeth without the rubber dam, does not do his duty to the student. If any young man will learn to fill a tooth well with non-cohesive foil, and observe all the principles involved in that filling he will very soon acquire the additional qualities and points that a more cohesive gold filling requires.

My friend Dr. Wetherbee last night made a statement that gold is the only material with which the root of a tooth ought to be filled, under all circumstances. I admit the statement is true, so far as it goes, with certain modifications. Dr. Wetherbee and I had a little difference of opinion in Cincinnati on the same subject. I want to ask you, after you have devitalized the pulp of a tooth, and attempt to extract that pulp, and do not bring it all away, (which you do not, in nineteen cases out of twenty) do you believe under those circumstances it is best to fill that root with gold?

Dr. WETHERBEE: In reply to the question I have to say that in all incisors, cuspids, bicuspids and superior and inferior molars, the pulp in every case is entirely removed in my practice. Oh! Oh!

Dr. REHWINKEL: At what time after the application of the agent by which you devitalized it?

Dr. WETHERBEE: From ten to twelve hours is the best time in the world.

Dr. REHWINKEL: You say that every time, you are able, from ten to twelve hours after you make the application to the pulp, to remove it to the apex.

Dr. WETHERBEE: Yes sir, in every case. Oh! Wet-her-bee

Dr. REHWINKEL: You have very funny and very peculiar people in Boston!

Dr. WETHERBEE: We have very sensible people there, who are more ready to submit to a little inconvenience than to postpone an operation and increase the danger. Besides they have a dentist there who knows his business. (Laughter.) Not wet-her-bee!)

Dr. REHWINKEL: And my friend ought to add that the people are so sensible there that even their pulps have sense enough to get out when they have no business there. People west of the Alleghanies are not so sensible, and the pulps of their teeth have peculiar notions, and they stay as long as they can stay, and until they have to be removed by *hook* and *crook*, and we cannot remove the pulp entirely from a central incisor in less than from two to four days.

Dr. STOCKTON: I believe in both soft and cohesive foil. I believe that some teeth are filled with soft foil successfully that could not be filled with cohesive, and I believe there are teeth filled with cohesive foil that could not be saved successfully with soft.

We have everything at our hands so completely manufactured —instruments and everything, so thorough and so good that it seems almost impossible that any man who claims to be a dentist can make a poor operation.

One word with regard to the ink experiment of Dr. Fletcher, of England. I have tried that a number of times and I am satisfied that it is a failure. I believe that cohesive gold can be put together so tight and thoroughly that no ink can get around it. I believe Dr. Judd said, in some of his remarks yesterday that we

don't know many things positively, but I am confident that cohesive foil fillings can be put in so thoroughly tight that no ink can get around them, and they are just as effective in saving teeth as are soft fillings.

Dr. OSMOND: With regard to Dr. Fletcher's test I have one observation to make, and I think I shall be borne out by many members of the profession. I now assert that after malleting a filling perfectfully tight it can be malleted loose again, and in all probability Fletcher committed that mistake. I have seen fillings malleted loose again: I have done it.

With regard to gold being the only material for filling teeth I would say that I would use other materials under certain circumstances.

Something has been said with regard to the condition of the system of the individual. That alone is not to be considered. There are conditions of the teeth which may or may not have something to do with the condition of the individual. Generally, however, they are found to have some connection with the health of the patient. For instance, if a tooth is deprived of its proportion either of enamel or calcareous matter so that the walls will break down in malleting, I would not use gold because in such cases after the gold filling is put in, if you take a little glass you will find that you have broken up the wall. You cannot build a good house on a poor foundation, and therefore I argue in cases like that it is better to use something that does not require so much pressure. I therefore regard the assertion that gold is the only material for filling teeth under all circumstances, which has been made here, as wrong in principle.

Dr. BOGUE: It seems to me that the experience of Dr. Kulp is most valuable, and the results of his experience ought to be taken to heart by us. We do not realize the differences that exist, not only in constitutions but in the individual teeth which we are called to operate upon. Not many years ago Oliver W. Holmes in a discussion upon the degeneration of our race, took occasion to point out a fact which has been demonstrated by the vitality statistics, if I remember correctly, of Massachusetts, that instead of becoming a degenerated race we were absolutely improving. This is in opposition to the generally received view. He said that children who were formerly allowed to die were now, with

the additional knowledge which we posess, reared and made useful in the world. Is not this same condition of things true with regard to teeth? We all know the almost indiscriminate slaughter which was formerly allotted to them. To-day frail, weak, badly organized teeth are filled and saved. Not many years ago Dr. Allport made a statement to me which I remember: "Any man can put a good filling in a crown cavity." I said to myself, if that is so how is it that we find so many poor fillings in crown cavities? And that remark comes to me again in view of the remarks made yesterday and to-day with reference to these old fillings. I venture to say that the majority of them are simple crown fillings. We do not find fillings in cavities of any such magnitude as to-day are inserted by the use of cohesive gold foil and the mallet. Such fillings are not in existence so far as my knowledge goes.

There is a class of cavities, which no one in this room will question can be filled with soft foil, by the use of the napkin and a little labor. In another class, until we got the rubber dam we never accomplished good results to any great extent.

Dr. JUDD: I feel like saying a few words in relation to the various subjects that have been brought before the Association, and first in relation to the report itself. It seems to me that the idea contained in the report, the real spirit that actuated the report as it was presented has not yet been touched upon at all and I propose to allude to that in the first place for a single moment.

I think the idea that prevails throughout the report was that our practice as a general thing should be so modified as to allow us to do operations at a less price. I have some ideas that are not in exact accord with the opinions that were expressed in the paper, and I think that the condition of things will be found, in large cities particularly, to be about this: there is a class of people that are willing and able to pay for the very best possible operations, who are willing to submit themselves to all the inconvience of such operations and who will be satisfied with nothing else. Such people will naturally gather themselves around and patronize operators that do work according to their notions. We must have and we do have and always will have men of exactly that kind, who will spend all the time that is necessary in doing such work, and they will be surrounded by

such patients as those. Then there are others who spend less time, who are less skillful in their operations, that do not expend as much labor, who perhaps may use different methods of operating for the purpose of saving time and expense, and these will be surrounded by another class of patients who will be exactly suited and satisfied with this kind of work. And so we may go down until we come to the man that slips around the corner and looks to see that no one observes him while he dives into a five-dollar establishment for a set of teeth.

As regards practitioners in the country, to a considerable extent they must accommodate themselves as well as they can to their circumstances.

I think the paper was a little too conservative upon the rubber dam. You will see through the whole line of the report, it followed the philosophy of Aristotle—it recommended the mean between two extremes as a general thing. That is a very proper way usually to look at such questions as this, no doubt, but in the case of the rubber dam I think it leaned a little from the medium line, and did not take the mean exactly. I think we should use the rubber dam in a good many more cases than the gentleman enumerated.

I wish to say a few words in relation to this Fletcher question. I think we have given an importance to those operations that they do not deserve. I have a pretty clear idea of the course that he has pursued for a good many years and a pretty clear idea of his standing in England among the best men of the profession there. Fletcher is an exceedingly sharp man who makes amalgam and cement to sell. That is his principal business I think, and his next most important business is to advertise these articles to the profession, and in this very article in which he first brought out what he stated was a fact in relation to cohesive gold he went on to state that Fletcher's amalgam was not liable to such objections. I have consulted some of the first men in England upon this very point, in relation to his standing there as a dentist and an honorable man and an operator, and they have confirmed me in the views that I had formed before.

The recommendation of tin in large cavities I am not quite ready to endorse. It strikes me that this thing of using tin instead of gold amounts to just this, that we save in some large

cavities a very small amount of gold. The gold that it takes to fill a cavity, as a general thing don't amount to much. I do not pay any attention to how much gold I put into a cavity; I am not selling gold for a living. I charge for my time and my skill, and I intend to charge for the little knowledge I have acquired by experience and by observation, but beyond that I do not propose to charge. It seems to me as if the consideration was too small to warrant our discussion. I have no question but what soft gold works as easily as tin and we can make a filling of it as readily and with just the same labor and time as with tin.

A great deal has been said in the last ten or fifteen years as to cutting out all of the fissures in filling teeth. I am pretty certain that some person will misunderstand me before I get through. I have spoken upon this subject before, and attempted to speak as plainly as it is possible for me to speak, and I have almost always been misunderstood. I commence with asserting that in the majority of cases teeth are not cut out enough, but I want to call attention to one thing, and that is that these fissures are not necessarily the places in which decay commences, that is to say there may be fissures in which decay never commences. These fissures are natural fissures in the teeth. If we say we must at all times cut out all fissures we shall have an enormous amount of work to do every time we place a filling in the crown cavity of a molar; but the distinction I wish to be made, is that I recommend the cutting out of all fissures, so far as there is any indication of decay, and beyond that I am unwilling to go. I am [illegible]

I believe in filling the canals of teeth with gold, I do not believe in filling them with cotton, and of one thing I am absolutely sure that there is no better material than gold to fill the fangs of a tooth with; and I have been somewhat gratified that during this discussion I have seen no man here yet that arose and advocated the filling of teeth or the filling of the fangs, or root canals with cotton. I consider that a mark of progress. But as to the possibility of filling the canals with gold to the apex I have my doubts, or rather have not any doubt about it, for I am perfectly satisfied that it cannot always be done.

I have been employed in the last three years a considerable part of my leisure time in examining and writing up, as far as I was capable, a description of the canals of teeth and the fissures

of teeth; and in doing that, it has been necessary for me to examine a great many specimens, and I am absolutely certain that in a great many instances certain fangs of teeth cannot be filled to the apex, in fact no instrument in any way or shape or manner can be carried through to the apex.

Dr. WETHERBEE: I did not say in my remarks, or if I did I did not intend to, that all pulp canals could be filled to the apex. I said where you could fill with oxychloride or cotton or Hill's stopping, I would fill with gold.

Dr. JUDD: I am very glad that was the statement.

Dr. SHEPARD: This discussion has proceeded with quite as much interest as I had any expectation of calling out by my report.

There have been a good many unintentional misunderstandings and misrepresentations of the spirit of the paper, but on the whole I am thoroughly satisfied that the stimulus thus given has called out so full an expression of the views of so many members. The truth is that the great majority of people are poor or in moderate circumstances and nearly all are sufferers. The great majority of the dentists of this country must be dentists to these poor sufferers if their teeth have any care at all. A few are happy in ministering to the rich and can charge for time and skill, as the last gentleman said. It makes little difference to him or to many of us whether gold, tin or other material is used, the cost of the material is comparatively nothing; but the good dentist to the poor cannot put into a tooth gold which costs two, three or five dollars, and get back his money together with a fair remuneration for the long time it takes. The sufferers throughout our land must be attended to by some means. The dentist to the poor, who faithfully operates for one dollar an hour is just as respectable, just as much a benefactor of the race as he who gets ten dollars an hour for his services. A false standard of estimating a man's prominence by the extent of his fees, has obtained to too great an extent. I think it is high time that this Associatian as a representative body should make prominent the idea that it is not high fees, nor the fact that a man ministers to the rich that makes him to be respected by the profession and the public, but that he adapts means to the end, so as to do the most good to the people to whom he ministers, whether rich or poor.

As a natural result of this false standard, it is almost impossible in college instruction to get the student to care anything about learning how to use non-cohesive gold, or operate without putting on the rubber dam, or in a word, to learn how to save teeth with the least expenditure. A sadder result is seen in the terrible slaughter of the innocents, to make room for cheap artificial dentures, especially by country practitioners, who are and ever will be the majority of the profession.

I have practiced a good many years in the country and know how it is, for which experience I am thankful, and from which perhaps mainly springs the argument I have made for the respectability of cheap dentists and good, cheap dentistry.

I have no reply to make to those gentlemen who in criticising the report, have found fault with it for not doing what they have taken your time to do, namely, entering into a minute description of how to do this, that or the other operation.

Dr. McQuillen: The fees of a dentist do not give him reputation and position; it is the character of his operations. There is danger of cheap operations for the poor being misapprehended. Some of the best operators in the cities are supplied from the country. The talent of the village seeks the city, to enjoy the fruits of a reputation made by performing good operations for a small compensation. The best work should be done under all circumstances. I am opposed to the practice of filling roots with cotton.

With respect to fissures in the enamel, the finest probes should be used in making an examination of the teeth, and where such an instrument catches, the place should be cut into and filled. These fissures, microscopical in size, often lead to dentine in which the interglobular spaces are abundant, or otherwise defective in structure, and sometimes they open into cavities in which caries has accomplished its work of destruction without presenting any external evidence of the fact.

Dr. Allport: I did not have the pleasure of listening to the report of Prof. Shepard, but from the many compliments paid it I conclude that it was worthy of its author. I have not taken the pains to make notes of the particular points upon which I wish to speak and there are so many things that could be said in connection with this subject that I hardly know what to say.

I wish first to notice the remarks made in regard to the experiments of Mr. Fletcher, of England. Mr. Fletcher, it seems wished to demonstrate that cohesive gold could not be so accurately packed against the walls of a cavity, as to exclude moisture. To do this, he filled the cavity in a glass tube with cohesive gold and then immersed the tube in ink and it was found that the ink was secreted, or found its way between the inside of the tube and the filling—while a filling put in from non-cohesive foil did not admit of the passage of the fluid around it. From this experiment Mr. Fletcher concludes that perfect-fitting fillings cannot be put in with cohesive foil and that it is therefore unfit for use. Whether Mr. Fletcher has sufficient skill in operating to make his experiments reliable in such matters or not, I am not informed, only so far as what I have heard here to-day and by his own showing from the experiment he has given us. That some of our most careful and skillful operators can, under favorable circumstances, pack cohesive foil sufficiently well against the walls of a cavity to make good operations, no one who has seen their operations can doubt. But because, with great care and skill, good fillings can be put in with a material difficult to manipulate, is no reason why it should be recommended for general use. The question to be determined in adopting or recommending a particular preparation of gold for filling teeth with, is not whether Dr. Atkinson, Dr. Cushing, or our late friend Dr. Varney have been able to put in good fillings with it, but what kind of gold can with the greatest ease be accurately adapted to the walls of a cavity and the greatest number of teeth saved with it, by the average skill of the profession? The gold that should be recommended for general use, is that which the average operator can accomplish the best results with, can save the greatest number of teeth with. Many operators seem to think that in order to make a good filling, the gold must be cohesive, so that it will weld into a solid mass. Now, this quality in gold is only necessary when it is desired to build up and restore the shape of a tooth, and it is a very different operation from that of filling a cavity in a tooth, and necessitates the use of a different kind of gold from that which can be most easily adapted to the walls of a cavity and best excludes moisture and saves a tooth from decay. I do not advocate soft fillings

still it is not necessary that gold should be welded into a solid mass in order to make good fillings—fillings that save teeth. If any one doubts this, let them examine some of the old fillings of Harris, Maynard, Badger and Rich, or of our other old and good operators. We frequently find some of their old fillings so soft that an instrument can be stuck through them anywhere and still they are preserving the teeth, although they have been there fifteen or twenty years. And why is this so? Simply because they used soft, or non-cohesive foil, which was readily adapted to the walls of the cavity. But examine a large majority of the fillings put in with heavy or highly cohesive foil, by good operators of to-day and what will you find? They will be as hard as bullets and highly polished, but nearly worthless so far as saving the teeth is concerned, simply because the gold is not acurately packed against the walls of the cavity, a thing difficult to be done with highly cohesive foil. There are cases where it is almost impossible to get along without cohesive foil and make satisfactory operations. And it often happens that both kinds of foil should be used in the same cavity, but at all times, when it is possible, soft gold should be packed against the walls of the cavity and the result will be, fillings that the teeth will not discolor or decay around. It is very difficult for ordinary operators to pack highly cohesive foil against the walls of a cavity. It is exceedingly deceptive. They make retaining pits where they fasten the gold and because it does not tilt or rock in the cavity while being finished, they think they have good fillings. These fillings are finished and look finely, but wait three, five or ten months and in a large majority of cases, where these fillings have been put in by ordinary operators, the teeth will be found discolored or decaying around the fillings; so I say that while our best operators may put in good fillings with highly cohesive foil, it should not be recommended, or adopted for general use by the average operator. It has been said that by the use of highly cohesive foil, with mallet pressure, teeth with frail walls are less apt to be fractured while being filled than by the use of non-cohesive foil, with hand pressure. That harder fillings may be put into this class of teeth with cohesive gold in this way, than with non-cohesive foil, I have not a doubt. The reason is this: the more cohesive foil is, the more it contracts, or

non cohesive?

rolls up under pressure and draws from the walls of the cavity while being packed. The result is a hard filling, but one that does not fit or press against the walls of the cavity. As the gold does not fit tightly to the walls there can be no pressure against them, hence the enamel is not apt to be fractured, but in such cases moisture is sure to penetrate around the filling and the tooth discolor and decay; a result so frequently seen in this class of cases at the present day.

One word in regard to fissures. Dr. Judd says, that in cases where decay does not actually exist, it is not necessary to drill them out. Dr. McQuillen contends that in all cases, where an instrument will catch in them, they should be drilled out. As Dr. Judd says, fissures in teeth are natural, and they may sometimes be deep with no presence of decay. Any one accustomed to the use of the microscope and to examining these cases will tell you that these fissures will frequently be so deep as to allow an instrument to catch in them and still there will be no decay. As a rule, it is well to let well enough alone, but if there is an absolute decay and deep fissures running out from it, and the walls are soft and frail, in such cases it is well to drill out the fissure, whether they are decayed or not and fill all as one cavity.

Dr. Palmer: Between all metals that we insert, and the teeth there is chemical or galvanic action. Some will take issue with me when I say there is chemical action between gold and tooth bone. You have a right to do so unless you have investigated and been convinced to the contrary. I speak of chemical and galvanic action in terms synonomous. I care not which you use. I have no authority for it from the text books that I am aware of, but wherever we find chemical action we have galvanic action. If chemical action precedes it, galvanic action is on the wings of lightning and it will not take a long time to be present. You who understand the formation of a battery know that it is necessary to have two perfect conductors and one imperfect conductor, or two imperfect conductors and one perfect conductor. These shall, all of them be more or less conductors of electricity, or one of them shall be a fluid. Constructing the ordinary galvanic battery call the copper negative and the zinc positive. The acid is thrown upon the zinc, which is consumed

—that is the positive. It has been generally regarded that bone was not in general a conductor of electriticy, consequently no action existed between the acid and the tooth bone, but through that instrument which follows immediately after the microscope and which is the instrument which is to reveal to us the greatest discoveries in our science, next to the microscope, the galvanometer, it has been found to be otherwise. I made the test by taking a tooth and pulverizing it in order to increase the surface, and put it with gold in diluted acid. We are enabled by this means to measure our chemical action in a very few minutes, and determine which element is being consumed.

It has been stated that gold is a pure metal. So much the worse for the opposing element. We have the gold in the tooth which is the negative element. We have the saliva, the acids, or whatever may be present in the mouth, and we have the alkaline portions which are the positive element. We take tin for instance, and place it in opposition with the gold with strong acid and the effect will be to throw the tooth bone into the positive relation. Consequently we take any strong acids and the tooth bone would be consumed, but simply take and change it to an alkaline solution in the place of acids and we reverse the order. We have now thrown tin into the positive condition while tooth bone is restored or thrown into the negative condition. Any one who understands the laws of galvanism knows that by the presence of any substance in the tooth which is positive to the tooth, action must come upon that, and it will tend to preserve, if not preserve the properties of the other element in the battery; and it is as clear to my mind as anything can be, that the tin filling in a loose porous condition preserves the teeth because the tin itself is being consumed, and the tooth bone around it is rendered negative.

That answers the question to my mind perfectly clearly, that we have been puzzled with, regarding the antiseptic or the peculiar properties in tin filling to preserve a tooth. Understand I am not speaking to advocate or advertise the use of tin, but I must say that I prefer to fill with it in the six year molars, and for children for that reason not on account of expense.

Dr. WALKER: Our friend from Boston maintained that because gold was the best material in certain cases it was the

best in all cases including root canals. On this point only I wish to take issue with him. I believe it will be generally conceded by all close observers outside of Boston, that to remove all the material from the pulp cavities of very many root canals is out of the question. I hold that the properties requisite in a material to make a good root filling are quite different from the qualities requisite in a material to make a good crown filling. In the crown filling we want just such a material as gold, the only thing that will answer the purpose, but in a root filling it is not necessary that we should have a material that will resist magnetism or chemical action. We want something that will occupy the space thoroughly and that has an antiseptic property also. I hold while it is impossible in a large number of cases to make a perfect gold filling in the roots, on account of the peculiar fissures, on the other hand it can be done with a preparation of Guillois' cement. I take several broaches well softened, of different sizes, wrapping a little cotton upon them and with these the cement can be pushed into every portion of the cavity. In that way I maintain that a perfect root filling can be made with a material that answers all the requisites.

Dr. KNAPP: I desire to offer a few remarks relative to one part of operative dentistry, which was omitted in the report. I refer to cases of hemorrhage that occur after the extraction of teeth; it is well that that part of operative dentistry should receive from us a good share of attention. It seems that failures are often made to arrest hemorrhage which occurs after extraction. Most cases that occur, those that are not very obstinate, can easily be stopped by a wedge of cotton held in the jaws pressed down upon it in such a way as to produce a fair amount of pressure. When this fails I want to state a very easy and simple method of overcoming the most obstinate case of hemorrhage that can arise after the extraction of a tooth. Knowing as you do the shape of the root of the tooth that has been extracted, make an imitation of that root in wood, whittling out with your knife a piece that will exactly fit the socket from which the root was extracted. Then it can be cut off so that it will project a little after it has been inserted, the more easily to effect its removal when desired. After having fitted this to the socket ridding the socket of the old clotted blood that had accu-

mulated therein, it will be easy to cut a few little creases around the apex of this wooden root and into those creases can easily be twisted a few fibres of cotton. After that has been done it is an easy matter to saturate the apex of the wooden root and charge also the fibres of cotton twisted around it with a moderate quantity of the French preparation of perchloride of iron. Being thus charged, the wooden root is then to be inserted in the socket or alveolus whence the bleeding proceeds. Any one can easily arrest the most obstinate case of hemorrhage in this manner.

Dr. ATKINSON: I think I can show you a much easier, certainly a more rapid way, taking exception somewhat to the gentleman's statement of facts. He instanced a case of hemorrhagic diathesis and then produced a case to treat that was entirely different from that. The bleeding that occurs from the end of the socket whence the root is removed, is not such a case, it is not hemorrhagic diathesis. Why does the socket continue to bleed? Simply because the artery that enters the hole in the end of the root is broken off, leaving its attachment on all sides of the socket so that it is open. That is the reason why it continues to bleed. Hemorrhagic diathesis involves the capillaries and the gums, and I won't go into that just now, because that don't come quite to the point. You need not be so extra careful about whittling your sticks, but take a burr that will be sure to be large enough to embrace the entire end of that socket, and put it down and give it one turn through the clotted blood, and kiss your patient good bye!

Dr. KNAPP: You don't dispute that my method would be effectual. hemorrhagic diathesis.

Dr. ATKINSON: I do dispute that it is as well to go to New York by an ox-team, as to go in a car that is already prepared to go.

Criticism is a two edged sword, it cuts both ways and the criticiser may be criticised by what he says just as legitimately if he is in the presence of good men, as the individual whom he hopes to criticise. Criticism is used in the commom acceptation of the term simply as fault finding. That is not legitimate criticism at all. Legitimate criticism means to put things to a test and have the truth appear. If we could rise above the little bickerings, the differences of opinion in details, and grasp the general princi-

ples that ought to be promulged and established in this body, we would be able to exercise that kind of fairness that would enable us always to properly appreciate what each individual says.

The spirit of the report on operative dentistry I admire very much, and have very little criticism to make, certainly no fault to find with the manner of its presentment, and the only suggestion that I would have to make to chairmen of committees making reports is to give less of individual opinion and more of the statement of proved principles. Into this discussion has entered a great deal more of the mechanism of filling teeth and very little of an understanding of the principles by which mechanism alone can be properly brought to bear.

I venture that I shall not be opposed by any intelligent operator when I say at the cervical walls of the cavities an immense preponderance of failures take place. Then where do we need to be most careful, and what constitutes the greatest care? Keeping the locality in such condition as to enable us to see, so that we can tell when we have got on a sound basis. That may be done by wedging or by the rubber dam. How anybody can fill under the gum satisfactorily without the dam I am at a loss to see. I used to dress over night all such cavities with cotton saturated with creosote, so as to kill the gum back far enough to get it beyond the margin of the cavity. With the rubber dam all that is necessary is to cut away the excess of gum and drill a hole into the root of the tooth sufficiently large to allow a screw to be put in and then put on your rubber dam, hook it over that screw and when you have finished your work finish off the screw, with the rest of the filling.

Some advocate heavy foil, some light foil, some non-cohesive foil. Do good work by whatever means pleases you, but by all means do good work. I have not backsliden any further than it is backsliding to go to 30 since the introduction of heavy gold, and I don't see any necessity for it. I have seen from the hand of the best operators failures because of the want of appropriate packing. One other failure that holds in our highest Israel is made, even among our best dentists. We have but a very sparse thinned out minority that will obey the law of contour, that will take the shape of the tooth and restore it to the form it was before it was decayed, and until they do that it will not be perfect dentist-

ry, in my opinion. Until we so build out the gold as to bring the contour of the filling to impinge upon another approximal filling, or the face of the sound tooth so that you can bite even tough buffalo beef through every time, you will fail to accomplish the highest good, and you will fail to have met the requirements of the case. The human teeth stand in the jaw in a relation analogous to the staves of a barrel, and you cannot afford to lose the first one of them. You can hardly afford to lose the wisdom teeth. They are proper abutments; and it is this breaking of the arch that lays the foundation of the mischief, almost invariably. That is only in part true. In some mouths there is no crowding and in others the to crowding

I don't think there is any difference of opinion in the whole house, if we get at the opinion of men, with regard to the report made by Dr. Shepard. He said good cheap dentistry. What is cheapness? It is that which gives the greatest amount of service for the least amount of expenditure. Cheapness don't mean low pricedness by any means, for shoddy don't begin to be as cheap as the finest kind of well prepared material, and more especially so with regard to the tissues of our bodies. We must remit all these questions that are mere questions of price to the individuals themselves to settle, and I have yet to see the first man that does not ask enough for what he does.

Dr. Webb: Instruments of almost every conceivable form with the smooth, plane, or convex point along through various grades of serrations, the broken point, the alloyed gold point—all have been used and eulogized. The cohesive property of gold was recognized, and then Dr. Atkinson introduced the mallet as a valuable aid in the impaction of the precious metal, and both were adopted.

To-day the cohesiveness of absolutely pure gold is deemed quite sufficient for all purposes as a filling, except that it is best to pass it through the flame of alcohol when the operation is to be carried to a restoration of contour.

To-day also we have electricity applied as a force for the impaction of gold, and those who have used that representation of true genius, the improved electro-magnetic mallet, cannot but feel thankful to the inventor for it. The lightning-like blows impact the gold to a greater degree of solidity than has otherwise ever been accomplished.

Dr. TAFT: The preservation of the exposed pulps of teeth is a very important matter, one of the most delicate and difficult things with which dentists have to deal. It is a very important matter to conserve the life of the teeth and I am sad when I hear men continually talking about destroying pulps, poisoning them to death and sacrificing them, taking them away. That seems to be their whole thought and their whole inclination in this particular, to poison pulps and extract them and destroy them by any and all means possible. The pulp of the tooth is second only, if it may even be regarded second, to the presence of the tooth itself, because the value and usefulness of the tooth and the comfort that a person may have with it is dependant largely upon the presence of this body or tissue in the tooth. There are a great many persons with whom the destruction of the pulp is equivalent to the destruction of the tooth. There are many others with whom the removal of the pulp, under favorable circumstances and proper management does not immediately endanger the loss of the tooth. But even under the most favorable circumstances the loss of the pulp in a very little time insures the loss or the detriment of the tooth itself. A process of deterioration begins the moment the pulp is destroyed. Its course is directly onward, sooner or later to the ultimate destruction of the tooth. That ought to be engraven with a pen of iron upon the mind of every dentist, and whenever he destroys the pulp of a tooth that fact ought to stare him in the face and deter him from ever doing it again. A great many say, I cannot save the pulp of a tooth. I hardly know how to answer such an objection as that. I know that men in the profession do save the pulps of teeth with great facility and in almost all cases. One may fail now and then, but that is not an argument against the effort to preserve the great mass of pulps of teeth as they are presented in practice.

How will the work be accomplished? By pursuing a rational, reasonable course, as you would in the treatment of any other tissue; not do the same things perhaps, but a knowledge of the structure, a knowledge of the conditions through which it passes, from its exposure, from the time of its taking on an abnormal condition to its death, will enable us to know what to do, just as

well as the physician, by his knowledge, will know what to do with the patient in the different stages of different kinds of affections. When the pulp of a tooth is exposed there are of course many conditions present. A tooth may be exposed by excavation and not be in a diseased condition at all. You know what I mean by that. The pulp may be in a state of comparative health and in a condition such as to enable it to be closed up and it may return to its former condition and live and perform its functions. When a pulp is exposed in this manner, and in this condition it should be simply closed up, so as to be brought as nearly to its original condition as possible. Cover it with some substance that will not be decomposed in contact with it, some substance that will be as much a non-conductor as possible, that will not impinge upon the pulp. Seal it up in that way and then fill the tooth and all will be well. If the tooth has been exposed for some length of time and has become inflamed and is painful and in an abnormal condition, what particular thing ought to be done for its restoration will depend very much on the conditions present; both systemic and local conditions must be recognized.

Dr. Rehwinkel says in his neighborhood there is so much malaria that he cannot save the pulp of a tooth. He says they have to take quinine by the ringing of the bell. How much there may be in that I don't know; but one thing I do know, and every intelligent dental physician will bear me out in this: systemic conditions must be recognized and systemic treatment must be made to conform to the conditions present. It will be utterly impossible to succeed in many cases without systemic treatment. Local treatment will also, in most cases be required, and what is the first movement in local treatment? It is simply to clear away the *debris*, to remove everything that will serve as an irritation to the exposed tissue, accumulation of foreign matter within the cavity of decay, dentine or anything of the kind that would serve to irritate the pulp of the tooth, and after this, something to correct any offensive condition that may remain in contact with the pulp should be applied, oftentimes merely that which will disinfect, and many things will accomplish this. It is difficult to give a formula for anything that will be applicable, strictly to all cases. Carbolic acid, chloroform, spirits of camphor,

permanganate of potash and many other things may be employed. If the pulp is inflamed, has taken on an abnormal or diseased condition, the treatment will be modified by the stage in which it is. It may be necessary to deplete. Sometimes that is a good thing, but not always. Oftentimes depletion by mere puncturing of the pulp is the thing to be done to relieve the distended vessels, upon the same principle exactly that depletion would be performed anywhere. Then stimulants to increase the circulation within the tissue and so relieve it in that way. In some cases tonics and astringents may be applied to give tone and strength to the vessels within the tissue.

The object is simply to relieve the part and bring it to a state of health by such treatment as will reduce the inflamed condition that it may be in. But even if it has gone on to the stage where pus is thrown out, pulps may then sometimes be restored to life and saved. I know there is an opinion entertained by some that so soon as there is a discharge of pus from the pulp it is a gone case, that it may as well be destroyed at once. I do not know what Dr. Rehwinkel will say about that. I know that pulps can sometimes be brought to life and can be maintained in that condition for a long period of time, even if they have come to the state of discharging a small amount of pus from them.

I have been using for a couple of years simply oxide of zinc with creosote or carbolic acid to apply over the pulp, because it will occupy all the space, will not make pressure upon the pulp, will cover it up completely and will not be offensive to it. When I can have the entire treatment of a case, especially if it has been one that has recieved some treatment, I prefer to let it remain a time before filling it with gold. Within the past two or three months I have been using lacto-phosphate of lime, or lactic acid and phosphate of lime. I use the lactic acid and phosphate of lime because I can keep them without deterioration. The method I have been pursuing is to have the lactic acid and phosphate of lime separate, and when a pulp is brought to a condition to be covered up, I take the phosphate of lime and lactic acid and make a paste of them, and place it on the pulp in the manner I described with the carbolic acid and oxide of zinc.

Dr. THOMAS: I quite agree with Prof. Taft when he says

that we should endeavor to save every pulp that comes under our observation, whether it has been exposed by accident in excavation, or by the action of caries, and I am of the opinion that every one in this house is well settled as to the propriety of this practice. But there is another class of cases that has not been touched upon, that is teeth that remain in the mouth after the pulp has been devitalized. Such cases have given me a great deal of trouble, and they are constantly giving young practitioners trouble.

I formerly treated such teeth through the canal, by enlarging the opening, and was almost invariably troubled to complete the operation within a period of perhaps a month. Within the last two years I have followed a practice which had been recommended to me, viz: cleansing and filling the root at once, and then making an opening through the gum, down to the apex of the root, not with an excavator or a pointed instrument, but taking a lance and opening it freely, and then trepanning the bone; then I apply the remedy.

Of course judgment must be used. It depends on the nature of the case how much must be excavated, but I believe in cases of that kind all that is required will be one application.

Dr. Rehwinkel: I am as anxious as anybody in the house to save a pulp. I would avoid however going to the extreme in that direction, as I am careful to avoid extremes in other directions. I have a great admiration for positive men, because of all things in the world I admire a man who is where I know I can find him.

It may do very well for a professor of a college who scarcely could do otherwise, to state that it was scarcely possible that a case could arise in which the pulp of a tooth could not be saved, by some means or other; I, not having that responsibility upon my shoulders am at liberty to admit in my humble judgment that there are cases where we serve our patients better and where we do our duty more fully when we destroy it in the best and most harmless manner that we know of. I have moral courage enough to state here that I don't think it wrong, on the contrary I consider it good practice under certain circumstances to resort to the use of arsenic for the purpose of devitalizing the pulp. I

Arsenic! Arsenic!!!

don't do it in all cases, but when I make up my mind to kill, I want to do it promptly, I don't want to do it by inches or by degrees. I don't want the tooth pilled to death, I don't want to fill around it and kill it by degrees; whenever I come to the conclusion to kill that pulp I do it with one blow, and I use arsenic, and I have yet to see the first case where bad results could be clearly and unmistakably traced to the effects of arsenic.

Nine-tenths of all the pulps are doctored to death. The simpler the treatment the better it is, and the greater the probable success will be.

Dr. CUSHING: At the meeting of this Association held at Nashville three years since, a paper was read entitled "Light versus heavy gold," in which the author, Dr. Abbott, claimed to establish by experiments therein detailed, the fact that a cavity well filled ~~with soft~~ unannealed gold of light number, would non Cohes contain a greater quantity of gold by weight, than the same cavity would contain if equally well filled with heavy cohesive foil.

This statement has never been publicly controverted, and though at the time the paper was presented, I felt confident in my own mind that its conclusions on this point could not be true, yet I was not prepared to refute the statements by any experimental demonstration. I felt too, that the experiments he detailed were not fairly made, though intended to be so by their author. It seemed to me impossible for the fairest results to be arrived at where all the experiments were performed by the same person, who did not profess to be an expert in the use of heavy foil, while he was in the use of the light numbers of soft foil. Believing that these experiments could not be verified, I borrowed from Dr. Abbott his instrument and instituted some experiments myself, in as fair a manner as it seemed to me possible to do, hoping to secure a scientific demonstration of the point. To this end I addressed the following note to Dr. W. W. Allport, of Chicago, whose capability of packing well as great a quantity of soft gold into a given cavity as any person in the profession, probably no one will be disposed to question:

550 MICHIGAN AVENUE,
Chicago, July 25th, 1874.

Dr. W. W. ALLPORT:

My dear Doctor: I am desirous of demonstrating, by the fairest attain-

able experiments, the relative weight of different plugs of heavy and light gold in a given cavity. For this purpose I desire to have you fill the cavity indicated in the steel plate, once in the old fashioned method formerly practiced by yourself, with soft unannealed gold, and once in the method which you are now practicing.

If you will do this and weigh each plug accurately, and indicate to me in your reply what methods you employed, or any peculiarity connected with either experiment I shall be greatly obliged to you.

I desired to have you make these two experiments, as thereby I shall be assured that I have the highest standard of comparison possible to be attained in this or any other country.

Very truly yours,

GEO. H. CUSHING.

To which I received the following reply:

CHICAGO, August 3rd, 1874.

My dear Doctor: On my return home this morning, I found your note of July 25th.

I have filled the cavity marked on the steel plate, as requested. I will forward the fillings to you at Detroit, this evening.

The filling marked "A", is filled from Abbey's No. 4 soft foil, annealed over a spirit lamp, as used, and packed with mallet pressure; there being a slight covering of cohesive foil, on the surface. In packing this filling, I directed my assistant to mallet in her usual way; but as the plate rested upon an unyielding surface, I have little doubt, that the filling is a little more dense than the same blows would have made it had the operation been made in a tooth in the mouth.

The filling marked "B", is made trom the same foil, unannealed; there being a slight covering of cohesive foil on the surface, packed with hand pressure. It is in every way an "old fashioned" or an "*old fogy*" filling, such as I used to put in twelve and fifteen years ago.

As you will probably have other fillings to weigh, I leave these to be weighed at the same time, and upon the same scales as you weigh the others, so that their comparative weight, may be more accurately ascertained.

In conclusion, allow me to say, that, whilst these experiments may give you the accurate relative weight of plugs made from different preparations of foil, the ascertained fact, in my judgment, has less practical significance in arriving at a just conclusion, as to the most suitable preparation of gold for filling teeth, than dentists are in the habit of thinking. It is not so much the *amount* of gold, packed in a given cavity that saves the tooth from decay, as it is the accuracy with which the filling fits the walls of the cavity. In fact almost any dentist of reputable skill, can pack enough in weight, of any kind of gold, in a tooth, to preserve it from decay, *provided*, that *that* gold is accurately packed against the walls of the cavity.

If therefore, dentists will in the future, be earnest in demonstrating the kind of gold, that can, with the *average skill of the profession, be most accurately and securely packed against the walls of the cavity of decay*, rather than in determining the relative weight of different plugs, made from different foils, we shall in a few years see fewer hard and beautifully polished fillings with blue or blackened teeth around them, than we do at the present time, a result which would be reached by a more general use of a semi-cohesive or soft foil similar to that made by Abbey, rather than by the using of so much highly cohesive foil as is used at the present day.

I can only wonder, that a practitioner, of as much experience and good judgment as Dr. Abbott, could have attached the importance to his experiments that he seems to have done.

Yours truly,

W. W. ALLPORT.

To Dr. Geo. H. Cushing.

The plugs made by Dr. Allport weighed respectively:

A.—17½ grains.

B.—17½ grains.

Those made by myself in the same cavity in the steel plate, weighed:

No. 1—of Ashmead's No. 3 cohesive, using very small pellets and annealing each as used, and using a very fine pointed plugger, 15½ grains.

No. 2—of Williams' rolled gold No. 120, annealing as used, and using a larger pointed plugger, 19½ grains.

I submit these experiments chiefly because I do not wish to have go out from this Association the records of experiments which would lead to erroneous conclusions.

There is no especial importance attending these results, except as establishing the truth regarding a matter of philosophy which a member of this Association had unwittingly placed before the world in a false light.

I do not here propose to discuss the relative merits of heavy and light gold, for though for myself I prefer as a general rule the heavier cohesive gold, and believe that in skillful hands it produces on the whole better results than the lighter soft gold, yet I agree to a considerable extent with the views expressed by Dr. Allport; that is, that the quantity of gold packed into a cavity is not of so much importance as that it

should be properly packed against the walls and margins, nor does it so much matter whether it be light or heavy, soft or cohesive so that it is placed where it is needed, in the most skillful manner.

REPORT OF THE COMMITTEE

ON

DENTAL ETIOLOGY.

By J. H. McQUILLEN, Chairman.

IN presenting a report under this head, I would direct attention to the fact that in viewing the pathological conditions presented by the dental organs, we must not forget that they are integral parts of the organism and governed by the same laws that control diseased action in other portions of the economy; in other words, that the causes of disease in the teeth as elsewhere are divisable into *predisposing* and *exciting causes*. The *predisposing* cause being in the teeth, defective structure of the enamel or dentine, due to hereditary transmission, (as in the so called syphilitic teeth,) or the prevalence of certain constitutional diseases during the formative period, or defective nutrition in maturer years.

The *exciting* causes are those external influences, such as the action of acids, variations of temperature, mechanical violence, etc.

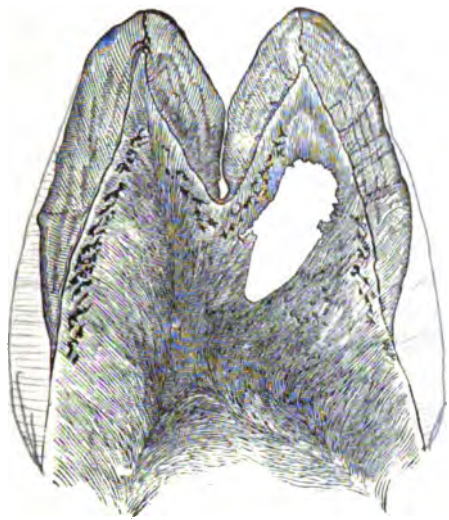
As in other organs the predisposing cause of disease may remain dormant for years, or even an entire lifetime, if the exciting causes are not brought to bear with sufficient force upon them; so the same thing is true of the teeth. Classified as the teeth are with the skeleton by the anatomist, and in chemical composition more analogous to the bones than other tissues, it would be reasonable to infer that in diseased conditions of the osseous system, that the teeth would be very naturally affected by such conditions. And this we find to be the case. In con-

firmation of this I propose to invite your attention briefly to these relations as manifested in the diseases known as Rachitis or Rickets, Osteoporosis and Mollitis Ossium.

Rachitis or Rickets is a disease of early infancy, characterized by a deficiency of the inorganic and organic elements of the bone; the carbonates and phosphates of lime, and the *Osteine* are alike insufficient in quantity and defective in quality. In some instances it is an intra-uterine malady but most frequently does not make itself manifest until the eighteenth or twentieth month of infancy. Both sexes are liable to it. Of the *causes* inducing this affection, some cases seem to be hereditary, several members of a family being attacked; its origin has also been attributed to strumous, syphilitic, or scorbutic conditions of the system, and residence in low, damp, ill-ventilated places; the most prolific and unquestionable cause, however, is the use of unwholesome food or imperfect alimentation, inducing an impoverished state of the blood and defective nutrition. The affection may be confined to certain bones or extend to the entire skeleton. It is attended by excessive softening of the osseous structure, so that it yields to the slightest pressure, and the bones can be bent and twisted in various directions, and often occasioning serious and irremediable deformity.

The teeth of patients who in early life have been affected with Rickets are generally found defective in structure; the enamel generally presents a roughened and pitted appearance. On making a microscopical section of such teeth, (which I have frequently done, and now have an opportunity of showing you one of the specimens under the microscope on the table,) fissures will be observed in the enamel reaching almost to the dentine, whilst the dentine in immediate proximity to the enamel presents that defect of structure known as the inter-globular spaces. So prevalent is this latter condition, that in every tooth I have examined under the microscope from a rickety patient, they have been quite numerous. In a communication entitled "*Microscopical Fissures in the Masticating Surfaces of Molars and Bicuspids*" published in the *Dental Cosmos* Vol. 13, page 300, 1871, and subsequently republished in the *Monthly Microscopical Journal of London*, Vol. 6, page 182, 1871, I directed attention to the fact that the minute openings or fissures found in the grind-

ing, proximal, buccal, palatine and lingual surfaces of molars and bicuspids, frequently lead to cavities of some size. In confirmation of this I gave a description of a microscopical preparation which my friend Dr. R. W. Varney, of New York had placed in my hands; of which I present the following extract from the article named:



"In the accompanying illustration, (of a longitudinal section of an inferior pre-molar, as seen under an 8-10 objective and No. 1 eye-piece, magnifying sixty diamaters,) it will be observed that a minute fissure, invisible to the naked eye in the section, extends from the bottom of the sulcus on the grinding surface of the tooth, through the enamel, almost to the dentine, and enlarging at the lower part into an oval cavity. This is entirely the result of defective formation, the enamel prisms having failed to coalesce at that point, and thus a condition is presented favorable to the retention of fluids and semi-solids, which undergoing decomposition would speedily destroy the thin septum of enamel covering the dentine. In the latter tissue, closely contiguous to the enamel, a number of black spaces (the *inter-globular spaces*) will be seen. Here again is located defective structure, and a prolific predisposing cause of decay."

"As evidence of the practical bearings of these investigations, it may be well to direct attention to the fact that the existence of these spaces in teeth whieh have completed their growth must be regarded as an *abnormal condition*, predisposing such teeth to decay, and that when either by mechanical action, as by a fall or blow, or by the penetration of external caries, such spaces are reached, the *disease here would run riot;* hence the importance of care on the part of patients and operators to have the most minute cavities filled, for though reached only through a microscopical opening, the result would be the same, while if protected from the action of external influences, or the *exciting cause of decay*, this predisposition might remain dormant for a lifetime as is some times the case with other diseases."

Osteoporosis in contradistinction to Rickets is an affection of the bones produced by dilatation of the Haversian canals, lacunæ and canaliculi, and sometimes attended with softening of the tissue of the bone; whilst in Rickets there is a deficiency of the mineral constituents of the bone and of the osteine. According to Rokitansky: "This state may result from excessive development of the medulla of the bone, or of the tissues which occupy its canals and cells; while, at the same time, the actual quantity of bony substance remains unaltered. By a rarefication of its tissue of this kind the bone becomes increased in volume—expanded. The walls of the enlarging cavities become thinner and thinner, till at length, apertures are formed in the interior of the bone, as well as in its outermost lamella, and the cavities communicate with one another. The expanded bone is soft, coarsely porous, and spongy; and more or less so in proportion to the degree of the disease; it yields to the pressure of the finger, and may be easily cut with a knife."* The affection is most frequently observed in the bones of the skull and may occur at any period of life, but is most frequent in childhood and old age. Among the recognized causes of Osteoporosis are Syphilis, Scrofula and Rheumatism. I have had only one opportunity of examining a case of Osteoporosis. My friend Dr. Wm. Pepper having

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* Rokintansky's Pathological Anatomy, Vol. 3, Page 138.—Philadelphia, Blanchard & Lea, 1855.

brought to me a phalange of the finger of a boy, age fourteen, a native of England, who died February 8th, 1868, after a painful illness. His face, arms, and limbs had become very much enlarged and exceedingly painful prior to death. The true nature of the affection was not recognized until after his decease. After making a microscopical section of the bone, I requested Dr. Pepper to supply me with one of the teeth for microscopical examination, stating at the same time that I had reason to believe that the *inter-globular spaces* would be found quite abundant in the dentine. Having complied with my request by giving me a canine tooth, I found on making a section of it confirmation of the opinion I had expressed; the inter-globular spaces being scattered throughout the coronal dentine. Whether this would be found to prevail generally in the teeth of persons affected with this disease remains to be determined by subsequent investigations. It is not only an interesting but also an important point to determine, as it has a practical bearing upon the durability of the teeth, as some cases of Osteoporosis are curable; it being succeeded by induration of the affected structure.

Mollities ossium or Osteo malacia is quite a different affection from either of these named and attacks persons who have reached adult or advanced life. It is a rare but most destructive and dangerous disease of the bones, characterized by softening of the osseous tissue, dependant upon the gradual removal of the earthy constituents and the deposition of a reddish sero-albuminous, oily or greasy substance. According to the authority already quoted*: "The bones diminish in size and their texture is rarified and atrophied; they become saturated with fat, and reduced to their cartilaginous element. In this condition their corpuscles are empty and when viewed by transmitted light, diaphanous; there are no canaliculi (Kalk-Kanälchen) and the lamellar structure is lost. The bone at the same time undergoes a striking change in chemical composition, the extract produced by boiling being not only different from chondrin, but also from the animal matter of bone."

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* Rokintansky's Pathological Anatomy, Vol. 3, Page 142.—Philadelphia, Blanchard & Lea, 1855.

The cause of this complaint seems to be involved in obscurity; in some cases it appears to be connected with a Rheumatic tendency. It is more frequent in the female than in the male sex, and sometimes makes its appearance after child-bed. The affection may be confined to certain bones, or extend to the entire skeleton as in the case of Madam Supoit, whose bones had become so completely softened that her limbs could be placed in almost any position. The lower extremities for instance could be bent so that the toes touched the back part of the head, while her arms could be thrown into equally distorted positions. She had lost all control over them, and was unable to move any part of the body with the exception of the head and left arm. The disease frequently begins during pregnancy or within a short time after parturition. It is said to be in some cases hereditary, presenting itself in three successive generations, but not prior to puberty. Of all the affections which we have considered, this one is the most interesting to us on account of the fact that the teeth are coincidently and seriously affected; thus it is not an unusual thing to find young women whose teeth prior to marriage were remarkable for their beauty and apparent perfection of the enamel and dentine and which under the excavator and drill, when demanding attention, had been found hard and exceedingly difficult to cut with a keen instrument; after bearing one or more children these teeth undergo the most remarkable change; decay making its appearance in various directions and the tissues cutting under the instrument with facility and as if composed of gelatin; and the decay not unfrequently progresses with such rapidity that one or more teeth are lost after each pregnancy, thus confirming the old adage: "For every child a tooth is lost." Are we not justified in attributing the softening of the bones in Osteo malacia and the remarkable softening of the teeth, to the fact that during the period of pregnancy the demands of the fœtus in utero for the calcareous constituents in the food taken by the mother to build up the osseous structure are so imperative and exacting that the mother is robbed of those constituents so essential to repair the interstitial changes taking place in her bones and teeth? And is it not also reasonable to infer in the cases that come under our observation where the teeth are so remarkably affected or changed during the period of pregnancy, that

the osseous structure has suffered at the same time, but not in a sufficient degree to attract the attention of the general practitioner? I have never made a microscopical examination of the teeth of a person affected by Mollitis Ossium, but believe that it offers an interesting field for investigation.

ADDITIONAL REPORT

ON

DENTAL ETIOLOGY.

By MARSHALL H. WEBB, a Member of the Committee.

ETIOLOGY—From, αιγια cause, and λογος, discourse or description—the science of causes; that department of philosophy, or of science, which treats of the causes of phenomena.

The words of our title are intended to embrace the causes of all those processes destructive to the dental tissues following the periods of their formation, development and solidification.

During the embryotic period of the tissues, whilst the formative process is going on, there may be deficient dental nutrition, or, during development, there may be an interruption of such nutrition, caused by some general affection such as measles or scarlatina, so that when the teeth are solidified and erupted there may not only be insufficient density to withstand the attack of destructive agents, but also permanent defects.

Then, too, not only are temperaments, diatheses, and idiosyncracies inherited, but the teeth, also, oftimes bear the impress of special affections through hereditary influences.

Investigations, in this department of our specialty, are principally directed to the etiology of the phenomena of decalcification, softening and destruction of the dental tissues. Such phenomena therefore, will be considered under the title of Etiology of Dental Caries.

Original imperfection of tooth-structure, especially where the teeth are in contact so as to favor lodgment for foreign substances; insufficiency of calcareous constituents in the central portion of

the enamel prisms, and an unusual number of inter globular spaces throughout the dentine; incomplete coalescence of the prisms at the sulci and fissures of bicuspids and molars, so that particles of food may be impacted into these interstices during mastication—all such conditions establish a proximate cause of caries, so that when these substances are converted into an acid product, the teeth are soon involved in disintegration. Certain conditions of the oral cavity may favor the formation of acids as well as the parasitic plant—the leptothrix buccalis—which is regarded by Lieber and Rottenstein as having very much to do with the progress of dental caries. Wedl, though not enunciating the same views, yet recognizes that disintegration of the dentinal structure is, in some instances at least, accelerated by the presence of leptothrix masses and acknowledges that in nearly all cases of soft caries, fungi are present. Hallier is of the opinion that leptothrix is a form of development of the fungus pencillium glaucum.

Lieber and Rottenstein succeeded in obtaining, from experiments upon natural teeth by means of dilute acids, results identical with those of Westcott, Allport, Mantegazza and Magitot. Caries of the teeth, however, has not been successfully imitated; yet acids are said to produce upon the enamel, phenomena which are also observed in decay of this tissue.

Lactic acid has been found to be most abundant in the mouth, though acetic, tartaric, butyric, oxalic and citric acids also act upon the teeth. It has not been found necessary that acid solutions be strong, to separate the carbonic, or even the phosphoric acid from the lime with which they are combined.

Enamel, in its normal state, is translucent; dentine is of an opaque-whitish or yellowish shade. Enamel, when attacked by acids, loses its translucency, whilst carious dentine becomes translucent, aud almost cartilaginous, owing to its loss of inorganic elements. Previous to dissolution, no special change in the elements of enamel has been observed except that it is easier to recognize, in enamel undergoing decalcification, the structure of this tissue, than in normal fragments, when the union of the prisms cannot be so distinctly seen. This phenomenon is duc to a loss of calcareous constituents.

Soon after the dissolution of the enamel, the leptothrix buccalis has been observed to have penetrated deeply into the clefts and

interstices of decalcified dentine and to have extended its influence through the tubuli toward the pulp. Since microscopical investigations have been made in this department of science, observations have taught that the tubuli adjacent to disintegrated dentine become enlarged, and that, too, in cases where, through unaided vision, the dentine would have been pronounced normal and caries be considered only superficial. Lieber and Rottenstein attribute this enlargment of the tubuli to granulations of leptothrix. They discovered that there is formed at the surface of enamel unexposed to friction and uncleansed, a bed of leptothrix. They, also, consider as probable that the leptothrix penetrates the dental cuticle, if still existing, and destroys it.

Destruction of the teeth of children is often due to a green fungus called the protococus dentales, a vegetable parasite, which acts upon the labial surfaces.

In view of the discoveries made in relation to the etiology of dental caries, it seems reasonable to infer that acids and elements of leptothrix penetrate the fissures opened in the enamel and further disintegration ensues, and, upon reaching the dentine, the destructive process goes on with accelerated rapidity. By the almost constant proliferation of leptothrix the decalcified dentine becomes decomposed into irregular parts, which, near the surface, are separated into yet smaller parts, and the destruction of tissue is thus finally completed. In consideration of all this, it would appear that if caries be superficial, the remaining tooth-structure can be saved by the removal of such decay, but if the dentine be involved, none but magnified perceptive power can ascertain whether elements of leptothrix remain in the tubuli or not, even when all decomposed matter is supposed to have been removed and the surface polished. If the walls of the tubuli be distended, and elements of leptothrix remain, then caries will, very probably, again ensue, especially if there be an acid condition present, which acid, besides doing its work of decalcification, also favors the proliferation of leptothrix—it having been observed by Lieber and Rottenstein that this parasite flourishes most luxuriantly in acid solutions. This recurrence of caries will not take place if a portion of disintegrated dentine remains at the bottom of deep cavities, for when all save this has been removed, and the cavity of decay is filled with a suitable material, so as to

exclude air and moisture, such fungi perish, or the destruction of the leptothrix may be previously accomplished by an application of carbolic acid. When dentine is attacked it is best to remove the carious portion, excepting that which may directly cover a nearly exposed pulp, and fill the cavity with gold, or whatever substance indicated, rather than cut away tooth-structure sufficiently to obliterate the caries. I believe that is sound doctrine. W.

Under favorable circumstances calcareous deposits appear to first fill the tubuli, commencing at the exposed portion of dentine and sometimes resulting in a formation known as secondary dentine, upon the interior surface of the pulp chamber. Magitot believes that these deposits spring from the pulp and that such deposition is induced by slight irritation of this tissue. Lieber and Rottenstein regard as proven that the deposit upon the interior surface of the pulp chamber cannot be identified with that which fills the tubuli, yet also consider that these formations, as well as normal dentine, take their origin from the dentinal cells of pulp. They also observed that the masses of leptothrix contained in the dilated tubuli are sometimes impregnated with calcareous salts, but that these deposits are most commonly met with in the undilated canaliculi of deep layers of dentine changed by caries. These calcareous granulations have also been observed in the inter globular spaces. When dentine is exposed through the removal of supposed superficial caries, or otherwise, and before calcareous matter can be deposited, decalcification may continue, the elements of leptothrix proliferate, and caries again be the result. Mr. John Tomes, whilst regarding the phenomena of the deposition of calcareous elements as brought about by vital action, yet considers it more than probable that the dentine, thus consolidated, loses its vitality. This loss of vitality in dentine, when consolidated, is evidenced by the part being non-responsive to the touch of a metallic instrument. When, therefore, the enamel is decalcified, the dentine involved in the carious process and the remaining tissue underlying this, is transformed into non-vital substance by such calcification, then the same agent which acted upon the tooth's almost mineral dome, will the more readily act upon this. Part by part is thus destroyed, notwithstanding nature has, from time to time, erected barriers, in the

form of such consolidation, for the protection of the pulp and as a means of saving the remaining dentine.

We frequently see exposed surfaces of roots polished, and caries thus prevented, but this seems to be brought about by the action of an antagonizing tooth, or the mastication of food between two such. Since no vital action can take place in non-vital tissue, this phenomenon appears to be due to such mechanical process, causing the impaction of particles of the dentine, upon the exposed surface, into the tubuli; or, indeed, this mechanical action may compress the tubuli, which occupy at the necks of the teeth, a nearly horizontal position.

Salivary calculus, accumulating about the necks of the teeth causes irritation of the surrounding parts, and, insinuating itself beneath the margin of the gums produces absorption of the alveolar processes and the consequent loosening and loss of the teeth. The salts contained in the calculi appear to be precipitated in the saliva and then gradually deposited upon parts of the teeth unexposed to friction. Late researches confirm the statement that filaments and granulations of leptothrix, as well as epithelial cells, leucocytes, etc., are embodied in masses of salivary calculi. The leptothrix has been discovered by dissolving away the calcareous portion of these masses by means of dilute acids.

One can frequently observe that in mouths where there has been an excessive deposition of salivary calculi about the teeth, decay has made but little progress, and *vice-versa.* Such conditions are found not only in the mouths of those of middle age, but in the case of the young, whilst the aged often become edentulous from this cause.

The secretions of the submaxillary and sublingual glands are said to be constantly alkaline, whilst that of the parotid may be slightly acid. This acid reaction is thought to arise from the carbonic acid absorbed in the liquid, which holds in solution the carbonate of lime with which the liquid secreted by the parotid gland is abundantly provided. When the acid reaction ceases, the carbonate, as well as the phosphate of lime is precipitated and deposited upon the teeth. The fluids of the mouth may be neutral, or even alkaline, and the precipitation of calcareous matter may not ensue because of a lack of the salts held in

solution by the saliva, or there may be a diminution of the salivary secretion.

When the oral fluids indicate a decided acid reaction, and the carbonate and phosphate of lime, in solution in the saliva, are dissolved instead of being precipitated, it would seem that, with such action upon calcareous ingredients, the acid would have spent its force and have become neutralized; yet decalcification of the enamel and dentine may still ensue, which process aided by the leptothrix which has in such a menstruum its greatest stimulant, soon results in fully pronounced caries.

Unless the progress of caries be arrested by artificial means the work of decalcification goes on; granulations of leptothrix accelerate the destruction of tissue, the membrane which encloses the pulp tissue and lines its chamber is reached, and through almost constant irritation, inflammation ensues and the pulp is destroyed; the whole crown is soon gone, and the thin brittle edges of the deep pulp cavity scarcely rise above the surrounding tissues, reminding one of the crumbling walls of a ruined castle. Irritation, congestion and inflammation of pulp tissue, and, consequently, odontalgia, death of the pulp, and, also, as a subsequent condition, suppuration and development of abscess, with its attendant evils, result from dental caries. Indeed to caries may be traced almost every manifestation of disease connected with the teeth. Necrosis of the maxilla may ensue through chronic abscess; which abscess is caused, almost always, by mephitic gass arising from putrescent pulp tissue and escaping through the apicial foramen; devitalization of the pulp follows inflammation, the result of irritants finding lodgment in a cavity of decay, and all this concomitant with dental caries.

DISCUSSIONS.

Dr. Noel: I have always regarded Dr. Watt as the dental chemist of this organization, and I expected when he was discussing the action of acids upon the teeth, to hear him make some reference to the agency of lactic and acetic acids, in the production of decay; he passed over it, however, without referring to it, and therefore I would direct your attention for a moment to this point.

It is a well known fact among physiologists, that saliva has the power of converting starch into sugar, and the sugar thus formed, is grape sugar. Cane sugar, is often present in the mouth, being used as food, and as a condiment, and by appropriating the elements of water, which are always present, cane sugar (C_{24} H_{22} O_{22}) may be converted into grape sugar.

This grape sugar composed of C_{24} H_{24} O_{24}, may, by a heat of about 98 or 100°, be split into lactic acid, which is represented by the formula C_{12} H_{12} O_{12}; one molecule of grape sugar, producing two molecules of lactic acid. Grape sugar may be split into either lactic or acetic acids, either of which will attack the lime phosphate of which the teeth are composed. Some difference in temperature, some difference in conditions, not well understood, may determine which acid shall be formed. The reaction may be represented thus:

C_{24} H_{24} O_{24} [grape sugar] = 2 (C_{12} H_{12} O_{12}) [lactic acid.]
Or, C_{24} H_{24} O_{24} [grape sugar] = 6 (C_4 H_4 O_4 [acetic acid.])

I want to give my idea of the action of these acids in the disintegration of the lime phosphate of which the teeth are composed.

This is the tribasic phosphate, and is formulated (3 Ca O) P O_5. By the action of either acetic or lactic acids the tribasic is converted into the bibasic phosphate, leaving the enamel or dentine, as the case may be, in such a condition that it may be washed out.

Thus: 3 (Ca O) P O_5 [tribasic phosphate] -|- C_4 H_4 O_4 [acetic acid] = Ca O. P O_5 . C_4 H_4 O_4 [acetate of lime] -|- (2 Ca O) P O_5 [bibasic phosphate.]

Or, (3 Ca O) P O_5 [tribasic phosphate] -|- C_{12} H_{12} O_{12} [lactic acid] = Ca O. P O_5. C_{12} H_{12} O_{12} [lactate of lime] -|- (2 Ca O) P O_5 [bibasic phosphate.]

As I have before remarked, we may trace the origin of these acids in the mouth, either to sugar directly introduced, or to the mutations which starchy food undergoes, when allowed to remain long between the teeth. Wheat bread, potatoes, beans, and many of the staple articles of diet, furnish the elements from which these destructive acids may arise.

A very important statement
and I think as true as important.
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REPORT OF THE COMMITTEE

ON

DENTAL EDUCATION.

BY A. F. McLAIN, CHAIRMAN.

OF late years, a gradual loss of confidence, amounting almost to positive distrust seems to be gradually taking place in the minds of many of our leading practitioners of dental surgery with reference to the efficacy, or rather, thoroughness of instruction as obtained in dental colleges.

This feeling has apparently grown out of a common belief that graduation in these Institutions has become too *facile*, less however, from the incompetency of their teachers, than from rivalry among themselves, and motives of pecuniary consideration, which they assert, is tending to fill the ranks of the profession with persons wholely deficient in those necessary qualifications which should distinguish the true "dental surgeon."

Viewed dispassionately, the accusation just alluded to against dental colleges, has no foundation in fact, for it is well-known that no body of men has exhibited more disinterested devotion to, or has made more pecuniary and personal sacrifices for the cause of dental education, than the professors of dental colleges. With a few exceptions, all of these teachers, it can be shown, have contributed not only largely of their means in founding and organizing these institutions, but have been laboring zealously session after session in imparting instruction to their classes without present compensation, or even without an ultimate expectation of receiving emoluments however small for the arduous services they are rendering. Mercenary or interested

advertised [illegible]
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motives, therefore, cannot indeed, be imputed to them. But, it must be conceded, however, by the unbiassed mind, that dental colleges have in later days failed in a great measure, to meet the expectations of the profession, whose rapid and material advancement in the fields of *art* and *science*, has rendered a higher order of requirements essentially necessary to its members. Therefore, the character, educational attainments, and the proper culture of those who propose to enter within its fold, are of an undoubted, vital interest to the profession, conditions upon which its future status depends. Hence, it naturally looks to dental colleges—the legitimate source and medium of instruction, for that complete and systematic training of their pupils, that would place them on that elevated scale of excellency which is so desirable, and which is in so perfect accord with the progressive spirit of the age.

On close inspection into the workings of dental colleges, it will be perceived that, although they have in nowise deteriorated in the quality, or retrograded in modes of teaching, yet the charge of inefficiency made against them, is not entirely groundless, for they have been remiss, if in nothing else, in failing to elevate the standard of professional education proportionately with the wider scope and greater range which dentistry as a specialty of medicine has taken in the domain of science.

One of the causes of defective dental collegiate education in this country, is attributable to the usual custom which obtains of final examinations being conducted by the professors in person, who by frequent intercourse for one or two seasons with the candidates for honors, expose, as a natural consequence, the weak points of the latter, hence, the examiners' sympathies, become enlisted and, though unconsciously to themselves, they naturally relax in rigidness; which if it does not lead to partiality, at least. tends towards a leniency that is calculated to act detrimentally to a proper grade of qualifications, subversive in itself to a great extent, of the just ends this formality is intended to promote, The leniency referred to, consists in propounding leading questions, and those that the candidate could not fail in answering if at all observant, by having heard them solved previously at the daily or weekly class examinations.

Another serious defect in the teachings of dental colleges, one

which, I think has given the most cause for dissatisfaction, arises from the common usage they practice of graduating students on attending only two sessions; which is tantamount to making dentists of them in eight months of actual methodical studies; for it is a well-known fact, that during the interim between the lecture seasons, little, if any progress is made by them, in consequence of the unsystematic and desultory manner in which they pursue their studies. Under such circumstances, it is therefore utterly impossible, however apt students may be, coming as they so often do, with no previous preparation, to attain any great degree of manipulative skill, or make much proficiency in the scientific departments of dental surgery in so limited a period of active pupilage. In the mechanic's arts, for instance, where executive talents are those mostly cultivated, an apprenticeship of not more than two years, is ordinarily considered inadequate to make a competent workman. Then, how very futile it is, to expect dental students to become masters of a profession which involves the possession of the highest order of manipulative and artistic skill, besides an intimate acquaintance with several abstruse scientific subjects, in which a life-time study could not give perfection. Now, taking into consideration, the totally unprepared condition already alluded to, in which the average number of students present themselves at colleges for the first time, manifesting a perfect ignorance of even the elementary principles of practice, or forming no adequate conception of the range of studies appertaining thereto, nor to what extent they should be carried, the wonder is, that any of those short term graduates, so to speak, ever attain more than mere mediocrity in the practice of the profession. This complete lack of preliminary education on the part of dental students generally, has prevented dental colleges from adopting a higher curriculum, and thus forced them to continue to pursue merely rudimentary courses of instruction.

It has been thought that statutory enactments would cure the evil, but they are insufficient to impart to colleges that enlarged sphere of usefulness and efficiency which are expected of them, and for the want of which they are encountering so much opposition. Laws regulating the practice of dentistry would do this, however. They would prove salutary in elevating the

status of dental surgery as a profession, by shutting out from its ranks, those grosser and more reprehensible elements—charlatanism and ignorance. It should not be forgotten, however, by those who are criticising these institutions, that the very elevated position enjoyed to-day by dentistry as a profession, has been the outgrowth of the educational efforts of dental colleges, with the co-operation of dental associations.

Now, what is needed to make these institutions all that is desired, and to give a character of worth to their diplomas, is for the members of the profession to furnish them with better materials than they have done heretofore; and for the accomplishment of which object, they should not accept as private pupils any but those who posses a good primary education, and are fitted by nature for the vocation, then at the same time obligating them to pursue not less than three years of private instruction and then to pass regularly through some reputable dental college, whether its curriculum requires an attendance of three or five terms in order to obtain its honors.

But dental colleges, on the other hand should adopt the plan employed by English medical schools, of confiding the examinations for degrees, to competent boards—outside of their respective Faculties, so that the possibility of diplomas being awarded to candidates otherwise than for real merit could not arise, or give occasion for suspicion that degrees have been conferred through motives of kindness or from favoritism.

Furthermore, nothing would tend more toward elevating the standard of professional education than for colleges to lengthen their courses to five or even six months duration, besides making an attendance upon them of from three to five sessions a *sine qua non* for graduation.

The adoption of reformatory measures for improving and keeping up the standard of dental education is no less a duty which dental colleges owe the profession, than it is a matter of self preservation. For, at the rate they are now manufacturing an inferior grade of dentists, with many exceptions be it said, the profession at no distant day, is destined to become *overrun*, and thus prove destructive to its remunerative prospects, while the reproach brought upon themselves would result pecunarily to their own material injury.

Though the first of the colleges that would take the initiative step in the course just indicated, might, in the beginning sustain a diminution in patronage from certain quarters, yet, the fees resulting from an attendance upon an increased number of sessions would more than compensate them for this loss—besides gaining the moral, as well as the physical support of all dentists interested in dental education, from witnessing the marked superiority in point of ability which their graduates would present. At all events, when the example is once set, no doubt, all dental colleges will follow in the adoption of rules and regulations of a similar character.

ADDITIONAL REPORT

ON

DENTAL EDUCATION.

By G. W. KEELY, a Member of the Committee.

THE branch of dental surgery is certainly a legitimate specialty of medicine. It should assume its true functions in the healing art, and its relation to the medical profession in general. Its practical processes should be controlled by the principles of medical science. Granting this, the basal elements of dental practice will be found in a thorough study of the whole physical organism.

A satisfactory acquaintance with these ground truths, should hereafter be required of every student of dental science, as the first step to bring our specialty into its normal relations to the general system from which it is a legitimate offshoot. The time has gone by when a mere mechanical skill, with a few general ideas, picked up in desultory miscellaneous reading, can be regarded as a preparation for the serious and delicate responsibilities of the dental practitioner.

He is a member of a learned profession, to whom the community look up with increasing respect, in proportion as those qualities develop. Knowledge, which is power in every other branch of human activity, is no less such in that branch of the healing art, which takes cognizance of one of the most important functions of the human economy.

The coldness of the general medical practitioner, has hitherto been a barrier to that intimate association, which should exist between the two professions. This has been remarked by den-

tists from abroad, who, not comprehending the true state of things, are apt to lay the blame upon the dentist; whereas, the fault lies with the other party. It is not to be supposed however, that this seeming prejudice, can forever resist the influences of reason, and common sense. Let the dental practitioner demonstrate his worthiness of professional companionship, by thoroughly grounding himself in the fundamental principles of medical science, and apply them to his chosen specialty by legitimate, logical, and practical processes; let him manifest a commanding professional skill, a thorough culture, and general manhood, and he will find the narrow spirit of professional bigotry, which refuses to recognize the scientific brotherhood of this special branch of medicine, gradually narrowing itself out of existence. Dental education must then be extended to embrace all the basal elements of medical science. A thorough indoctrination in these, demands a preliminary broad literary culture. The mind must be versed in the general rudiments, and trained in all the methods of logical thought which develop the understanding. The sensibilities of the heart and monitions of the conscience, no less need the genial impulses of æsthetic and moral culture. Dental practice and science, need a fully developed and highly intelligent manhood as its basis. The college diploma is too often a fraud upon the community, but one so transparent as to work little injury save with the ignorant. The literary and scientific training truly represented by that diploma, is the least that the professional man should be satisfied with, as the basis of his professional education. The elements of general medical science might be acquired by the candidate for dental practice, in the medical college proper, provided there was a harmonious co-working of the two professions in education. In the absence of this mutual understanding however, it may be thought best by those who bear the responsibilities of dental education, to provide adequate facilities for instructions in general medical science in the dental college. It is of less importance *where* the work is done than that it be well done. Whether the medical college should organize a special faculty in dental science and make its curriculum of studies conform to the necessities of students devoting themselves to the special practice, or, whether the dental college should secure the services of skilled medical professors,

to teach the fundamental elements, is a question which may be better answered after an adequate experience.

At present, there is ample room for dogmatism in the absence of facts. What is here insisted on, is, that this preparation should be honestly and thoroughly made. Having *these* elements learned, the student is prepared to take up the study of the special branches of science pertaining to his calling, from a more commanding position, and with a far more intelligent appreciation of their significance and value. His mind is already trained to habits of investigation, and hence he will not spend the time required by imperfectly educated minds, in order to assume the proper role of study. An immense mass of preliminary principles, will be incorporated with his understanding, and leave him a great amount of time for the higher elements of his profession, which the imperfectly educated man must apply to laborious study of the rudiments. Perhaps in thus broadening the scope of preparation for the practice of dentistry, we may cause impatient aspirants to turn away in disgust, and resolve that they will ignore all such requirements, and rush to seize the emoluments of the profession by some shorter road.

Let such remember that the time for this has passed by; success in any scientific calling demands a far more elaborate preparation, than in the last generation.

The leaders in dental practice, many of whom acquired their professional learning without the facilities enjoyed by the young men of this day, are the foremost in recognizing the necessity of this broad and noble culture.

The requirements of the practice are daily calling for a more advanced and scientific intelligence, and they who minister to these demands must have laid up in their mental organization, the natural and required abilities to grapple with the ever increasing responsibilities. A young man who rashly assumes professional responsibilities, without thorough and honest preparation, is not only condemning *himself* to a very meagre share of the benefits of his calling, but is criminally exposing his unhappy patients to the sinister consequences of his blundering ignorance. The student of dentistry should place himself and his studies under the direction of some competent preceptor, one of recognized skill and respectability, who is sufficiently alive to

the responsibilities of his position, and of the ever widening demand of dental science—who will require from three to five years of preparatory study. A sensible and honest preceptor, will first take the measure of his pupil, physically, intellectually, and morally. If he is found deficient in any required element of success, he should plainly unfold it. He should explain the necessity of thorough preparation for the duties of his proposed calling, and give him the broadest possible views of professional duty and the arduous demands which it will certainly make upon his energies and time. He will moderate his impatience to assume those responsibilities, and keep his mind fixed upon the grand goal of eminent success, to be won only by persevering effort. In directing his preparatory studies he will recognize the necessity of the best instruction in the general principles of medical science. He should not fail to point out the vast numbers of illy educated young men, which the rival medical schools of our country are annually sending forth to prey upon the distresses of the community. He will especially deprecate the same foolish and suicidal policy in the establishment of dental colleges.

The more intelligent men of the medical profession are becoming alarmed at the annual copious discharge from their schools, and know that this affluence of numbers, can be secured only at a large sacrifice of qualifications; they understand what inducments moral and local interests are prone to offer young men, which do not lie in the direction of hard study, and thorough preparation, but rather in the neglect of them. In order to swell the number of graduates, the standard of attainments must be lowered, which cannot be done without serious injury to the character of the profession.

The present time admits of less blundering in this direction, than any time of past history, as the demand for high and thorough qualifications for medical practice, is more pressing than ever. There are doubtless medical schools in the country, which do not *yield* to this demoralizing temptation, and which require as an inexorable condition to graduation, a thorough mastering of the elements of medical science, as shown by a severe and exhaustive examination. The diplomas of such colleges stand high, because they represent a definite amount of thorough preparation and training. To such a school, the prudent dental practitioner, will

direct his pupil if necessary, to receive his preliminary medical education, and insure the greatest amount of mental discipline.

The time is not far distant, when the dental colleges will be compelled to provide this preliminary instruction. To accomplish this greatly desired result, it will be well if the crying error of the medical profession be avoided. Instead of attempting to establish dental colleges in every great city, it would be the only wise and true policy, to concentrate efforts at a few leading points.

The number of practitioners of our specialty, must remain relatively small, in comparison to the medical profession, and hence it is folly to set up a grand array of colleges. Three or four will be ample provision for our whole country. Say one east, one west, and one south; and when the time arrives let one be established on the Pacific coast. For this number of dental colleges, it would be comparatively an easy work to secure a permanent endowment, by each section concentrating their efforts and means, and with a curriculum of studies embracing both dental and medical science.

The professors of the colleges already established, are very poorly paid for their services, and are compelled to eke out their subsistence, by active professional labor. This necessity must to some extent, impair the value of the instruction imparted. Each chair in a dental faculty, is sufficient to tax fully the energies of a first-class mind. The investigation of new points, the co-ordination of principles, and their adaptation to instruction, demand the undivided attention of the professor. His pupils may not at the time be able to detect any shortcomings in his labors, but in after years they may become conscious of deficiencies which they will be compelled to make good by severe extra labor, amid the toils of professional duties. This starveling policy will be found in the end to involve an enormous waste of time, effort, and money.

It is a notorious fact that not a single professor in any of our dental schools holds his position except at a pecuniary sacrifice. This is neither just, nor right, and no such unnecessary sacrifice should be required of men in the performance of public duty Our profession owes to all such, a lasting debt of gratitude. I am aware that this policy of concentration, will ignore powerful

local interests, and may provoke sharp recrimination. This, however, is one of the conditions of success in any great movement. The truth is ascertained only after discussion and even sharp altercation. But here we must not forget the amenities of gentlemanly and professional courtesy. When we are brought to recognize the necessity of concentration upon a few dental schools, we must resolutely hold to that policy, in spite of the clamor which may be raised by interested parties.

The absolute necessity of this concentration, is obvious to those best acquainted with the condition of our schools. By limiting the number, and concentrating our resources upon their endowment, it will be perfectly practicable to secure to each professor a competent salary. But, if we see proper to follow the foolish example of our literary and medical educators, and divide up our means in a great number of starveling projects, we will inflict upon dental education the disastrous evils which they are now deploring. We sincerely hope that the real state of the case may be seen before we become helplessly involved in the ruinous policy of dissension and division.

DISCUSSIONS.

Dr. JOHN ALLEN: Dental education embraces much more than a casual observer, upon a superficial observation, would suppose. It has been well said that every man has two educations, one which he derives from others, and one which he gives to himself. We have had elaborate remarks in these papers upon the degree of education that is to be derived from others. The few remarks I have to make now will be confined to the latter. It has been said of our dental colleges that they have not discharged their duties, that graduates have gone out from these institutions who have not met the requirements of their patients, and discredit has reflected back upon the institution from which they graduated. This is wrong and it is for want of this second education that this thing is met with.

In our institutions the pupils are expected to go as far as the books and their instructors lead them. It is too often the case that the students after graduating, will settle down into mediocrity and suppose because they bear with them a diploma, that is as far as they can go.

It is self-education that enables men to go beyond where others have gone, without which there will be no progress. After having exhausted what can be learned from books and teachers let the mind of the student then be turned upon itself, and it may be able to bring out hidden treasures that were never before revealed to men.

A celebrated painter remarked that when he wished to produce the desired results he mixed brains with his colors. It is a very important matter, especially in our profession that we mix brains with our work.

While concentrating our efforts to elevate our profession, in advancing the most important branch of it—the preservation of teeth, the artificial branch has been unfortunately neglected, and when I made the remark yesterday that that branch was lower

to-day than it was 30 years ago, I meant just what I said; but as a whole our profession stands higher than it ever did before.

Dr. WALKER: I hold that the dental profession occupies no mean position and am glad that this paper has so clearly stated my views upon some points of this topic. But I hope that our dental colleges will go a little further than any of them have been going. The man that merely confines his attention to mechanical manipulation of teeth does not go to the full extent of what a dental education should include. When we see so many of our best men in the profession breaking down, having to spend months after months away from their offices to recuperate, we see the lack of knowledge they ought to possess, the lack of appreciation of that whole education which should demand a knowledge of the system beyond the mouth.

Dr. TAFT: There are many obstacles that lie in the way of effecting a thorough dental education. One rests with the profession, those who assume to be private tutors. There ought to be great care exercised by every one who attempts the instruction of students. Care should be exercised in the selection of those who are encouraged to enter upon a course of preparation for dental practice. This care should have reference to the inherent ability of the student, his ability to study, and to his preliminary education. He should have a good literary and general scientific education, which should embrace, as has been stated in both the papers read, a thorough knowledge of all the fundamental principles and subjects pertaining to medicine and surgery.

I know that many have said it is better to go into the colleges at once, where there would be systematic training better than can be obtained in any private office. There are other things to be accomplished besides the mere instruction in the profession. A student comes in with almost an entire absence of a just appreciation of what he is about to do. Stimulate him, educate him to understand what he has before him and what will be required of him. Do not tell him that with a year or two of private pupilage and two courses in a college he can be as well fitted to practice dentistry as anybody, as is too frequently done. Give him to understand that it requires a thorough course of training.

The Mississippi Valley Dental Association years ago, when the standard was very much lower than now, resolved that its

members would not receive students for less than two years at the least. More recently the Michigan State Association passed a resolution that its members should not receive a student unless he took a pupilage of three years and at least two courses in a dental college, and I must say that from the State of Michigan we receive students as well prepared as from any other section of the country, if not better.

I have watched this thing closely and have observed where our best students come from. They come from the offices of men who give them a thorough training. One gentleman who read a paper this morning will not accept a student in his office short of three or four or five years, and when he gets them there he gives them a thorough training and drilling, and when his students enter the college they go prepared about as well as many students are when they pass out from the colleges.

The local societies are taking up the matter of dental education. The State societies are taking it up. That is all very proper, but it seems to me that a presentment should be made from this body in respect to this matter. This is a representative body and it cannot afford, for its own reputation, to let the local societies go in advance and lead it. We should make a pronouncement upon this subject that should be clear and unmistakable. A thorough consideration of the subject should be had here, and it should be carried down to the local societies, and if they all come up to the highest level that this body will take, uniformity can be maintained.

Let this body make a clear and unmistakable pronouncement upon this subject, one that cannot be mistaken by our educational institutions throughout the country, and no college in the country, I think, would ignore it.

Dr. THOMAS: You will all agree with me that the longer we are in the profession the less we desire to have students in our offices, but there are those that have such a strong attachment for pecuniary interest that students that have no business there, are continually admitted to offices; and I believe, as Prof. Taft remarked, that this association ought to take the initiatory step to lay out the ground work as to how young men shall come into this profession. I believe it is one of the cruelest things that a dentist can do to advise a young man that he can become a

dentist in less than seven years of study. I believe the time will come, and I hope to live to see it, when a dentist going out of a dental college will be just as well fitted to practice medicine as dentistry, because I believe dentistry is but a specialty of medicine.

My opinion is that no dentist should admit a student to his office at all. He should go directly to a dental college, because men have such varied ideas of dental practice. You cannot find two men who are practicing dentistry who have the same ideas as to how a child should be taught. I speak of them as children, because I believe they should enter the study as children, no matter how old they are.

I do not say but what there are a great many men who are practicing dentistry that are thoroughly competent, in every respect to take students into their offices to educate them without their going to a college, but those are not the men who will do it. Men who take students are usually those who have pecuniary interests in view, and for that reason I would be in favor of preventing dentists from taking students into their offices.

Dr. STOCKTON: We live in a busy age; haste is written on every hand, and as some one remarked, it takes but a little while to become a *grandfather* in dentistry. I think it was the Ohio Dental College, a few years ago, that prescribed as a necessary qualification of students that they should know something about the English language before they entered, but the pressure has become so strong that they have done away with that I understand, and have swept it from their books.

New Jersey has upon her statute books a law with regard to the practice of dentistry. There must be an examination before a board of censors and that board understand themselves so well that they reject any young man who comes before them unless he is so thoroughly qualified that they cannot, in all conscience reject him.

If it comes to this, that none can enter our profession unless he is a graduate of a college, in a very short time our profession will be just where we desire to see it, and there is where we must put down our feet, and say it shall come.

Dr. BOGUE: I do not conceive that the multiplication of State laws is going to affect graduates of dental schools. Dr. Taft says

colleges have enough to bear, but in my opinion the public opinion of dentists influences the action of colleges very much. We have never taken a stand which compelled the colleges to adopt a certain standard. One school will have a standard that we might all approve; another will sell its diploma for $25. We have to pronounce among ourselves such an opinion that they may take a different stand from what they now take.

Dr. BUTLER: If men come out with a diploma it should mean something. Diplomas are too cheap; we have too many graduates. I was once accused of disloyalty to the profession because when a resolution was offered in a certain society that we should require a three-years pupilage, to be supplemented by lectures and graduation, I said I would like to offer an amendment that the students should be graduates of a dental or medical school. I would make them to be graduates of both schools, and then they would not have too much knowledge to enter upon the practice of the profession.

I do not believe it is policy to send a raw student to a dental school, I don't care how good the school is. Fault is found with the schools and with the graduates, and yet there seems to be a disposition to multiply the colleges. I wish they were simmered down to two or three, and faculties put in that are good for something, and endowed; give them a sufficient fund to pay for good teachers. It has become a recognized fact that the most successful schools in teaching, and those that have the largest classes and turn out the best students are those that provide ample hospital and clinical instructions. It will not do to put an inferior man there to demonstrate mechanical or operative dentistry. The teaching of mechanical dentistry don't amount to anything. As Dr. Allen said, we are not as far advanced in that department as we were twenty or thirty years ago.

Dr. ALLPORT: A great deal can be said about this question, but the thing is to say something practical. It is easy to blame the schools, but not so easy to suggest some practical plan whereby a thorough education will be more general. There is a desire that dentistry should be regarded as a specialty of medicine, but the present course of instruction in either private offices or colleges is not the best to secure that end. The same course of study should be pursued that other specialists in medicine go

through with; books are studied and lectures attended for three years; and the extra time is devoted to the study of the special studies; and these cannot be pursued until a general knowledge of medicine is obtained. The student of dentistry, on the contrary, simply takes a partial course of reading, and commences work in the laboratory; thus studying a profession and learning a trade all at once. No one expects a trade to be learned in less than three years' apprenticeship. Certainly even mechanical dentistry requires as much preparation as that; and to properly practice all branches, a man must learn both a trade and profession in that time. The study and practice should be divided. Let the mechanical dentist confine himself to that branch, and let the dentist who treats diseases of the teeth become fitted as a medical specialist in a medical college; let him breathe the atmosphere of medical teaching; then we shall have done the same that is done to make ophthalmotologists and aurists. Designate mechanical dentists as you please, but drop the word *dentist* as soon as you can. We may have "dentologist" to designate those who operate on the natural teeth; the others may be called what you please, as "dentificer" or "dentician," but let them be called by different names, and soon they will be so recognized by the public, who will be better served than by the present practice.

Dr. MORGAN: I feel entitled to be heard on this subject, for I am the the oldest regular graduate that belongs to this association. I suppose there are in this country entering the profession at least 1200 dentists each year, and of that large number there are about 250 that attend lectures, that go to college. If you can devise any plan to get the students of dentistry in this country into the colleges, it will be a greater advance than we have ever made in five or ten years.

I am free to admit that our dental colleges are not what they should be. Much stress has been laid upon the term of tuition, the time which should be devoted to dentistry before a gentleman should be permitted to go forth to practice his profession. I do not subscribe to the importance of this matter. I think when an individual goes to a dental college and comes up before the proper authorities and passes his examination he ought to have his diploma. I do not care whether it is one year or ten, but I want him to be able to pass his examination, and I would

like to see all our colleges adopt that idea. I think in some of the institutions in this country that is the mode of proceedure. I believe in the medical department of the University of Virginia there are only three professors, and yet a diploma from that institution is the highest recommendation that a man can have all over the broad southern country, because they take their students and examine them at the end of one year, at the end of two years, at the end of three or four or five years, and when they earn their diploma they get it, and they get it on the ground of qualification and not because they have been there a given length of time.

If we can adopt some plan to get the dentists of the country generally, into connection with our associations, it will be one of the means by which we may remedy some of the defects in our education. In the State of Tennessee we have about 250 dentists. About 50 of those are connected with the dental associations. The others are beyond our reach; they do not take our literature; they do not read a single journal; they never mix with the profession anywhere, they stay at home and circulate around in their own circles, squat down in the little towns and we never see them. If we can adopt any plan to bring out that class of men—for I presume it is the same all over the country—so as to bring them in contact with the more advanced in the profession there will be much less difficulty about getting students into the dental colleges and giving them proper training.

We in Tennessee were among the first to adopt a regulation requiring every man connected with the association to pledge his students to at least two years pupilage and graduation in a medical or dental college before they proposed to practice in any other capacity than that of an assistant. We have not lived up to that very well, but it has had a very wholesome effect upon the profession in the State.

Dr. WETHERBEE: Public opinion is arrayed against the rapid and successful advancement of the profession. The larger part of the persons who require dental services are persons of moderate means, and they desire to spend their money to the best possible advantage, and they call upon the first man whose shingle they see, who will do their work for the least money.

We have not sought the public press as a means of communication with our patients. In the second place there are a great many practitioners who have not had a thorough office dental education; I mean they have not been instructed in the mechanical department, and I hold in opposition to the gentleman on my left (Dr. Allport) that you will not be able to divorce the mechanical department from the operative. It may be so in isolated cases but it will not be so very generally.

I know of men not more than 750 miles from here, who 30 or 35 years ago were in the habit of receiving students for a term of three years, the students finding themselves and paying $100 a year, and during all that period of time never were invited into the office or instructed one hour in operations upon the teeth, and I know of one man in practice in Boston to-day who was with his preceptor three years in the mechanical department and never saw a tooth filled, and did not receive one hours' instruction with reference to the method of filling teeth, and yet should that preceptor's name be mentioned, you would, for the honorable position he has held for so many years, award him a meed of praise.

I hold that no reputable dentist should take a student for less than three years, and also that the student should sign a contract binding himself by his honor that at the close of three years he will enter a dental college and graduate.

This, the leading association of dentists is to-day a stumbling block to our advance, and wherein? The association is made up of members who are graduates and non-graduates. We have men who never graduated at a dental college who are able, efficient, and honorable as practitioners, and successful too, but that does not cure the evil, and what shall be done? If you wish to aid them in the work in which they are engaged, change your constitution, and allow no delegate to come here except he is a graduate of a dental or medical college. When you have done this you will have accomplished something which is an example which will affect the whole country and wake men up to a desire to do something.

Dr. McQuillen: In listening to the annual criticisms of dental colleges in our national association, I am forcibly reminded of an utterance of that genial wit and humorist, the "Professor at the Breakfast-table," wherein he says: "When nature

invented, manufactured, and patented her authors, she made critics out of the chips that were left." It takes time, labor, and thought to write a good book, or to found, manage, and maintain a college; but with a breath or a few strokes of the pen slight faults can be exaggerated into great defects, and unfounded assertions of unfaithfulness to duty made without due examination of their authenticity. No one can be more conscious of the shortcomings and deficiencies of dental colleges than those who are managing them, and endeavoring, so far as they can with limited means and inadequate support, to increase their sphere of usefulness. Do gentlemen appreciate the trouble, time, and expense that those who are engaged in teaching are subjected to? Would it not be well if, in addition to criticising these efforts, they would aid in the cause of education by contributing money towards endowing the colleges; or, better still, spend their time and money in establishing and maintaining dental colleges, and thus show the profession how much better they could do the work? Why not criticise private perceptors in their unquestionable failure to perform their duty? For the vast majority of accessions to the ranks of the profession come from private offices. The curriculum of instruction in the dental colleges, in place of being lessened, has been enlarged. Formerly a winter course of four months constituted the annual term; now, in addition to that, in some of the colleges, there are spring and fall courses of lectures, with the dispensary and laboratory open all the year, where every opportunity is afforded for acquiring a practical knowledge of the profession without additional charge to the student. The standard of graduation has also kept pace with this.

Speaking not from isolated cases or a limited experience, but as one who has had every opportunity of observing the men who have attended lectures in the medical and dental colleges in Philadelphia during the past twenty-five years—the class of students entering and graduating from the dental colleges now, instead of being inferior to those of former years, is vastly superior in mental culture, for many of them have enjoyed every advantage in scholastic opportunities in the best universities of our own and foreign lands, prior to matriculating in our institutions. We are told that there should be fewer schools; that four would suffice, one in the east, one in the west, one in the south, and one on

the Pacific coast. Has the gentleman considered the question in all its bearings? Colleges are established not merely to supply the wants of the present, but the demands of the future; not only to educate those who are to serve, in our land, forty millions of people in the present, but five hundred millions in the future. Again, if all engaged at present in the practice of dentistry who need educating, and the yearly additions to the ranks of the profession who come in from private offices without an education, were forced by state laws or an enlightened public opinion to obtain a collegiate education, the dental colleges now in existence could not accommodate them; indeed, with the present facilities, the best arranged institutions in the country could not give that practical instruction which is such an important element in dental education, to more than one hundred students; whereas, on account of the different methods of instruction in medical colleges, five hundred to one thousand men can be taught, in a single institution, the theory and practice of medicine and surgery. If better instruction and increased opportunities for fitting the dental student to enter upon the practice of his specialty could be obtained by combination with medical colleges, I would say, God speed it.

A most melancholy spectacle is presented by some of our fellows who are constantly whining about the non-recognition of the profession. The question naturally suggests itself, is the fault with the profession or the individual? A man of culture, ability, and executive capacity has no occasion to complain of indifference to his rights on the part of others, and it is the influence of such men that gives character and tone to the profession in which they are engaged.

Dr. Crouse: There probably never was a time when the dental profession realized, as fully as at present, how much imperfection there is in the profession.

I can readily agree with some gentlemen that to improve our profession we must improve the materials we bring into it, but I cannot agree with everything that has been said about the superiority of graduates over and above others. It is my opinion today that their average is very little superior to the students outside in proportion to the number, and my observation has been quite extensive in that direction. Indeed, I am almost in-

clined to believe there was something wrong somewhere in the kind of education they have received. I live where we have plenty of incompetent practitioners, and a large per cent. are either college graduates or have attended one course; and there is either something wrong about the material or the education. When men start out and become dishonest from the time they commence to practice, when they associate themselves with the worst kind of mountebanks in the country, I say there is something wrong with the material or with the education, and indeed I have been almost afraid it was in the education.

Several gentlemen have spoken of the sacrifices of professors of dental colleges. I am aware that there are some earnest laborers in that cause—some earnest laborers that make sacrifices, but the very fact that when one college springs up in a city another must spring up, will show that it is a kind of quackery. It is simply one set of practitioners saying to the other, "If you start a college you are just that much above us, and we will have a college and be college professors."

The last gentleman on the floor argues that a dental college cannot educate more than a hundred students. I don't think they can educate a hundred with their present facilities. If I had a student I would not send him to any dental college that I know of. I would give him his education in dentistry myself, and I would send him to a medical college, because I should have a better field to select from than among the dental colleges. I am not going to argue that medical students are turned out much smarter or much better than dentists, because we have a great many mean medical colleges.

To educate a dentist you should do a great deal more than educate him as a manipulator; and this latter can be done a great deal better in an office than it can in a college. If I had a young man to teach how to operate, I would place him at the chair with his patient, and stand over him and tell him where his mistakes were. Can I tell a hundred students, can I tell twenty students a day where their mistakes are?

I don't see how we can expect to be recognized by scientific men until we become scientific. In order to make dentists you must educate them right, and in order to educate them right you must have the right kind of professors and the right kind of pre-

ceptors, and if you have the right kind of material you will turn out something that will be right.

Dr. ATKINSON: There is so much involved in the subject of dental education that it is impossible to concentrate into ten minutes a decent statement of what are the requirements. Dental education is really very far off, if we have to go back through surgical, medical and classical to academic education before we can get a proper dental education, finishing with the dental education proper. I am sorry to see a difference made between dental and medical education. Medical education is the basis of dental education. A man who has a dental education has already the elements of a medical education if not the practice.

Much has been said as to the ideal. I have my ideal of what education ought to be, but we have to take things as we find them in this world, and we have to operate with such assistance and appliances as are at our hand or invent those that our necessities squeeze out of us. Who of us knows what the first principles are, and who of us that has come through all the painful labor and anxiety of getting what little education we have, don't know the difficulty that lies in the way? Scarcely any of us know all the difficulties; if we could but recognize them as they arise we would be much better endowed, and possibly we would get them out of the way. If we were required to produce a voter for our government instanter, twenty-one years old, with a nice beard on, I don't know how it could be done. We will have to go back to the good old way and begin right, and very likely it will come out right.

How are we now as a dental profession, and what are our requirements? The history of dental colleges has been somewhat touched upon, and it has been truthfully stated to-day that the mother did not know the babe and did not recognize it, and it had to grow up alone, and has grown up alone, and has become so large that now, in the presence of the courtiers, it attracts more attention than its mother, and she is jealous. That is the square statement of the case. I have seen the same in families. They say the French women are very hard on their daughters, that they look better at 40 than the girls at 20.

I think that is just our fix exactly. It is because of the mechanical aspect of dentistry, like surgery, that enables us to per-

ceive distinctly when we have coincided with law, and when we have opposed law, and therefore the impression is more clear and distinct whether we have done good or evil. Here is just the difference between us and medicine. Medicine makes mistakes and the grave covers them beyond the perception of the keenest mind. The poor self-sufficient iconoclast that we intrust, ruthlessly tears valuable organs from their location, puts them out of the way, and after we find out the difficulty of replacing them, it is apparent that they had infracted law, and they cannot amend it. That is the reason why we have so much distinction.

I am with and against every man that has spoken. I am with him as far as he comes to my perception of the truth, and when he don't come to my perception of the truth I yearn to illuminate him, because I know I have the truth. Now, ain't we the gentlemen and ain't they the bores, ain't we the christians and they the vandals the world over? I don't care where you go you will find that law the same. Then who is the judge? Be the judge yourself, and be honest in your judgment and you are safe every time. For when you find you have made a mistake, you do not want to be fooled again. You do not like that kind of food at all. What is education? It is mental feeding, and nothing else. It is simply knowing what kind of food to eat, and if you know that which you will digest well, you will easily govern that taste.

About this diploma matter: sometimes I have said I wish there were no such thing as a diploma anywhere. If there must be diplomas, do have them say what they mean and mean what they say.

Who endorse and who are the endorsees? I can see many persons in this room that have papers who never attended a single course nor a single lecture to get them, and yet they are worthy of them; but they do not go through the right way, they say, whatever that is. If it is held up as a support of the method of education that has been finished by the granting of a diploma, it is an error and a mistake.

The brave men who made themselves worthy according to the self-educating system spoken of by Dr. Allen, did they make themselves worthy? No, the blessed love of the fountain of life made them what they are, and let them forget their egotism and

remember that all that they know was received at a time when they were in a receptive condition; when they had been so hungry to know, when they had reached out with that ardent desire, the divine grace came in and illuminated their understanding and revealed to them the truth. It ought to breed humility, and it ought to teach us that when we have been thus stall-fed, we may go back to the crib again and never say that we do it ourselves. Self education, as intended by Dr. Allen, we don't commend very highly, but we get self education only, in the sense that we breathe, when we can't help it. When we get very hungry for a breath we take it. Just so when we want education very ardently, we get it. As Dr. Morgan said, when there is a will there is a way, and we shall find it out. Then if you have diplomas, have them honestly obtained.

I have repeatedly said, sometimes before this body, and sometimes before other bodies, that I wish there were nothing but certificates of advancement, and the reason I say that is this: to graduate us to any standard which has been attained yet, will only leave us babes. We are not complete even in our best apprehensions of what ought to be and what will be requirements. Diplomas, as a rule, are a damage to a man that holds them, for they entrap him into the idea of thinking that he has been recognized, and now he has finished. That was not the intention of a diploma. It was simply an admission fee to the show, that is all. It is an admission fee into the atmosphere of observation, whereby he may be so intently engaged that the divine grace can come into him and obsess him throughout and make him luminous, that he may have light in which to perceive the truth, and then he will embrace it, for there is not a sinner on the earth that is so bad that he will go the way of darkness by preference, the whole pulpit to the contrary notwithstanding; and I am a *pulpiter*, too!

Then what shall we do in educating in great masses, as they do at the colleges? As to the differential education between dentists and the other world, I am not ashamed of the meanest outside dentists as compared with the meanest outside medical men anywhere, and if they make a difference between the medical men and dentists, I will cast my lot with the dentists. They have more genuine earnestness and goodness than the medical

men, take them as a class. Then how shall we get education? Education comes from an old Greek word. Sometimes I wish we could begin anew and have a new deal, and not go to the Greeks and the Latins and all the rest of the jargons. Does any one know that the middle partition wall is broken, and that the veil is rent in twain from the top to the bottom, and not from the bottom to the top? It was rent by that which came from without the human sphere; it came from without and entirely independent of the souls of men—from the top to the bottom.

Then how shall we get our education? By honestly seeking it, irrespective of how much it will cost. Although we claim to be christians, we are almost to the last man of us trying to buy cheap and sell dear. When we get that out of the way, we will be very well able to understand what education means. *E*, out of, and *duco*, to lead, a hybrid, a mule—*E* Greek and *duco* Latin —a Greek-latin mule that we are riding on. It is no wonder we are tipping over the fence first one way and then the other—half milk, half water. Duco—to lead out of. How did we get in?

Give me hungry students, and I don't care how many of them are in reach, as far as I can talk to them and see them, I will talk to them just as well as I can, but what we need is conversation —soul to soul communion, mind to mind interpenetration—just like this interpenetration of gases the people know so little about—until every one shall be satisfied and says yes—not that old nasty skin of the teeth yes, but one that comes from the bottom all the way up, and you feel that they see through the answer; so that when we know that the enquiries that arise in our minds are satisfied we are educated, and not till then.

Dr. Osmond: A great deal has been said about the poor compensation which professors of dental colleges receive, but it is very strange that there are so many who glory in the title of professor—pay or no pay; they like a handle to their names, and there are many who aspire to that degree who illy deserve it. I am in favor of a national board for the examination of students, and also for the examination of those who aspire to be professors.

How are the schools formed? A coterie of men get together and agree to have a college; a charter is very readily obtained,

and a board of trustees is appointed. The professors are not appointed by the board of trustees, but the trustees are appointed by the professors. That does not appear on the surface, but it is nevertheless done. In short, as a general thing, the board of trustees is simply a farce. Capital may be required, and all the money that can be secured must, as a matter of course, be had. The professor is not compensated, but he stands before the public as a professor and receives better fees in consequence. The next thing is to secure students. A circular is issued, and very frequently some honorary degrees are given to practitioners, in order to encourage them to send their students to this institution. Some of the colleges maintain their character, and some do not. In some the stock goes up, and in some the stock goes down and is bought in by men who aspire to the honor of professorships, in order that the stock being controlled by them, they shall be everlasting professors in that institution.

With regard to diplomas: the question is frequently asked, "What did you give for that diploma?" or it is said, "He bought his diploma;" and unfortunately it is so in many cases. Let the diplomas be given to those who deserve them, and be given without price, so that they shall be above suspicion. I would not have the professors examine the students, but they should be examined by a board. If the general government were to examine all professors by the same board, if you will, that examines the students, there would be an end to men having professor attached to their names who know nothing.

I here state, and am prepared to prove, that some of the worst quacks that ever infested our city or any other, are graduates; laughing-gas quacks, rubber quacks, etc. I know of one party who graduated after a session of three weeks, who never pulled a tooth in his life until ten months before, who runs a laughing-gas establishment, and who in four months was seen selling twenty-one pennyweights of gold which he had taken from teeth he had extracted. Over all such shops should be written Dante's motto: "All hope abandon, ye who enter here," for they simply purpose to destroy the natural organs instead of preserving them.

Dr. WATT: I am now not connected with any college. I was once connected with a dental college, in the first place as a

student and then as a professor, and I know that in that institution great care was taken to see that the students gave evidence of good moral character, manly disposition, etc. Some of them proved derelict afterward. I do not think there is an institution in the world, professional or classical, that has not had the same experience. Some of the older members of the profession will recollect, that for one year, the lists of questions were printed, and the students had no opportunity of knowing what questions would be presented to them. The examination was conducted in writing and occupied thirty-two and a half hours to each student, and the requisition was that a failure of more than twenty-five per cent. in one department and twenty per cent. in the other passed the student back and rejected him. That was the most rigid rule I knew in that institution.

Dr. REHWINKEL: Dental colleges have been very severely criticised; but have we asked ourselves the question whether we do our duty as a body and as educators. Do we fulfill our mission in our societies? Many members go away from our societies disappointed, although it cannot be denied that an immense amount of good has been done by associative effort. In fact, I believe that that alone has been the means of bringing up our profession to that standpoint which it now occupies, yet if such an important subject as dental education is spoken of, I believe it behooves us that we should closely examine into the proceedings of societies and into the manner in which we conduct business, and see whether we fulfill our mission in this respect. Are we each and every one of us teachers in the true sense of the word? Circumstances always modify cases, but that at some future day a different course will be pursued by dental colleges, can scarcely be doubted. Dental colleges have been made to see that where they have given good grounds for disappointment to the profession at large, the profession, on the other hand, has been made partially to see that they have failed to support and sustain and encourage dental colleges.

It has been alluded to here this morning that private preceptors have been sadly remiss in their duties towards sustaining colleges, and toward preparing young men for entering colleges. It is generally presumed that if a young man enters a university, a preliminary education, whether general or special, should

have been to a certain extent given to him, so that the college could build upon a foundation laid by the preceptor. Is that really the case? Are not our colleges obliged to go down and commence at the very foundation, and in many cases to insist that the student must unlearn what he has learned before he can learn what he is required to? In Europe the question has received large attention, especially in Germany, and opinion there is very much divided on the subject. One class insists that the dentist shall go to a medical college, in other words, that he shall be an educated physician before he shall become a dentist, and this is really the only way in which a thorough education in Germany is obtained, unless it is by private tuition. Hence there is a very exact distinction made there now in an assembly such as this. The lines are drawn so tightly and so sharply, that if gentlemen get up to speak, those who possess the title of "Dr.," for instance, and who claim it and use it, and allow it to be used only when they have a diploma from a medical college—these men will be called "Dr. A.'" or "Dr. B.," and right alongside of Dr. A. sits *Mr.* C., perhaps just as good a dentist and operator, and perhaps equally well educated in other respects; still there comes in a sharp distinction, and cuts him right off. That is one of the peculiar features of that country. In discussing the matter one class condem the American system. They insist upon a general medical education. Others again, especially those who have a more extended and thorough knowledge of the educational departments of this country, hold up to them the advantage which the special American schools of dentistry afford, and point, perhaps with a great deal of truth and a great deal of force, to the fact that as far as accomplished manipulators and operators are concerned, American dentists are far in advance of European; but they also claim that as far as real scientific attainment and education is concerned, they stand upon the same level, if not a little higher.

Dr. HORTON: Upon this subject of education I do not feel that we ought to criticize each other too harshly, except in the spirit of utmost liberality. It is said Daniel Webster, on the occasion of his graduation, supposing himself to be the best scholar in his class, and not receiving the highest honors upon the platform where he received his diploma, tore it up and strewed

it on the floor, and in the face and eyes of the faculty, declared that he would not carry that certificate through life to build upon as a foundation; but that he would build upon his own foundation, and he did.

It is not absolutely necessary that any of us have a diploma or a certificate. If we have it in us and have the knowledge, we need not fear that we shall not be recognized wherever we are. As Dr. Atkinson remarked this morning, I am willing to stand by the dental profession everywhere. I will go into any community in the United States of America and select the dentists, and submit it to the candid opinion of the community whether they do not stand favorably, as men and as professional men, as compared with the medical profession.

Dr. JUDD: I wish first of all to speak of this question in connection with our being a specialty of medicine. As I have stated before, if we are not a specialty of medicine, I would like to know what we are. If we belong to any profession, I would like to know what it is if it is not the medical profession. I apprehend that there is no necessity of carrying this line of thought any further, but I wish to speak particularly as to the question of whether or not we are acknowledged as a specialty of medicine as far as we really deserve; whether we have been treated by the medical profession as we deserve to be treated. I have some views upon the subject different from those that have been expressed by other speakers, and it seems to me when we take a fair view of the subject we have really no right to complain. The National Medical Association require that their delegates shall be medical men, that they shall be graduates of medical colleges, and if the American Medical Association should see fit to send a delegate to this body who was not a practicing dentist, we should most certainly reject him. It is true that there are a few medical journals in the world, such as the London Lancet and the Philadelphia Times, that have sought upon certain occasions to throw some discredit upon the dental profession which it does not merit. But I apprehend that the great body of physicians recognize the dentists to the fullest extent they have a right to demand. They do not recognize them all as polished physicians, because if they did they would make a mistake. They are exceedingly anxious that we should educate ourselves

generally, so that we should stand upon the same footing as aurists, occulists, and other true specialists of medicine. If we desire to be recognized as specialists of the medical profession, we should first make ourselves such. If we desire to occupy exactly the same position that other medical men occupy, we should educate ourselves as other medical men are educated, and it appears to me the best way to do this is in a medical college. The medical profession appropriate as teachers all of the best materials, and if we desire to have the benefit of those teachings, so far as the medical part of a dental education is concerned, we must get it where the best teachers are employed. Again, if there is a prejudice between the medical men and the dental profession at this time, how shall we eradicate this in the minds of the medical men better than by allowing our students to sit side by side with them in their colleges, and particularly side by side with them at their examinations, and show beyond all peradventure that they are their equals?

In relation to the dental colleges of the United States, I want to say that I believe they have done a great work, but that they are all what they ought to be I shall not affirm. I think this discussion will have a great deal to do in shaping the future course of some of the colleges, and will undoubtedly improve them all, and I hope this association will keep a close eye upon all the dental institutions of learning in this country, and that it will finally control them. Undoubtedly certain schools are kept up for the purpose of benefitting the professors and immediately surrounding dentists, and therefore I say that I hope that the final control of all institutions of learning in the country will be with the profession at large.

REPORT

ON

Mechanical Dentistry.

By E. D. SWAIN, a Member of the Committee.

AS one of the members of your committee on mechanical dentistry, I beg leave to offer the following: As to improvements during the past year there is nothing of importance, and the new things which have been introduced during that time have proved of very little value, or utterly worthless. Of the latter class vulcanizable gutta-percha has proved perhaps the most signal failure.

The various metallic alloys which have been introduced from ime to time, have not interested the profession to any great extent, and therefore have failed to come into general use.

Rose pearl, owing to the complicated method of its manipulation, has not grown into that general favor which was anticipated for it. The material itself, in its improved form, appears to possess many of the properties necessary for a good and durable base. A plate of this material inserted by myself more than a year since, in a mouth where great strength was required, as yet stands perfectly, far better than rubber had done.

Celluloid, because of the ease and simplicity with which it is manipulated, and the non-existence of a royalty in the form of a license, has grown greatly in favor, and is quite extensively used especially throughout the western states. During the past year this material has been greatly improved. It is now prepared from hemp, first made into tissue paper, which is subjected to the action of acids of tested strength, for a given length of time, kept in constant motion by machinery, all parts being thereby

acted upon at once and alike, thus securing an evenness of texture never before acquired. This effectually prevents the flakiness which was so prevalent in the plates prepared one or two years ago. This material has also been greatly improved in color, and the coloring materials used are less liable to oxydize. When directions are followed with the use of the steam apparatus, there is no liability to crawl or warp, or of the pins pulling out of it; finally, it must be admitted that this material alone, of all the new ones introduced to the profession, seems to meet with most encouragement, and the present prospects are that it may, when further improved, supersede rubber altogether; being quite as strong, conveying far more accurately the impressions which heat and cold produce in the mouth, besides giving, when properly manipulated, better adaptation to the parts.

Aluminum, which at first promised so much as a base for artificial dentures, possessing, as it does, so many desirable qualities, such as lightness combined with strength, perfect conductivity, &c., has, by practical experiment, been found to lack one of the most necessary qualities, viz: durability. While it readily withstands the acid secretions which may exist in the mouth, it is readily destroyed in a mouth with alkaline reaction. Therefore in a large per cent. of cases where inserted, it has been rendered utterly worthless in from a few months to three years. The first indications of failure with this metal are blister-like spots upon the plate where in contact with the mucous membrane. Upon breaking into these blisters, they are found filled with an earthy deposit; if this be removed it will be found to have either very nearly, or entirely, perforated the plate; by this means holes first make their appearance, which, like a vitiated ulcer, spread rapidly, soon rendering the plate worthless. This has been my experience with all swedged plates of this material. Regarding cast plates I cannot speak, having had no experience.

It has been suggested to me that the earthy material found in the blisters mentioned, is the result of imperfectly manufactured material, and that the residue of kaolin has not been entirely cleaned from the metal, and this may be the case. I have, however, experienced the same difficulty with plates constructed from carefully re-refined aluminum. If it can be proved that the failures with this material arise from impure or imperfectly manu-

factured plate, we have a metallic base which in many respects is superior to all others.

The many objections to rubber are too well known to this body to require a recapitulation here, though it may be safe to assert that the greatest is evidently the royalty we are forced to pay to the Goodyear Dental Vulcanite Company. Many of the other objections urged against this material can, however, be overcome by the use of the black rubber, which is lighter, possesses greater strength, and not containing vermillion does not produce that tenderness of the mucous membrane, sore throat, etc., so prevalent where the red rubber is used.

I have nothing to report concerning continuous gum, or gold work, further than that both are as reliable as ever, and are the cheapest in the end of all bases yet discovered.

Of improved machinery for the laboratory, I have to report only the steam apparatus for working the celluloid, which is in every way superior to and more desirable than the old method with oil; and Hopkins' regulator for vulcanizers, which effectually does away with all danger, besides saving much time and anxiety on the part of the workman. This machine is attached to the top of the vulcanizer in such a way as to regulate the flow of gas, and never allow the temperature to rise above three hundred and twenty degrees. Connected with it is a clock-work attachment which turns off the gas after the case is vulcanized, at any desired length of time.

I desire to enter a protest against that portion of last year's report, made by Prof. Eames, advising a separation of the mechanical from the operative or surgical departments of our profession Or more particularly, that in our dental schools it should be left entirely to the student to say whether he shall become proficient in this direction or not. It was admitted that students were graduated without their being able to pass a satisfactory examination in this branch of the profession, and that the professor of mechanical dentistry, in signing the diplomas, knowingly certified to what he knew to be false. It is my opinion that there is at present a very wide field for improvement in this branch of our profession. The number of articles which have of late appeared in the journals devoted to our interests, upon improved methods for setting pivot teeth, plainly indicate a growing desire

for improved means for replacing the teeth when lost. The continued experiments, by members of the profession, for the purpose of discovering a material possessing all the virtues of vulcanite with less or none of the objections to it, and the avidity with which a new material promising these improvements is experimented with, also show that we as a profession are dissatisfied and anxious to improve this branch of our calling. Assuming these statements to be true, I can see no good reason why our dental schools should just now endeavor to throw obstacles in the way of its advance, or should desire to relieve themselves of any part of the odium at present attached to the mechanical department of dentistry.

If, as has been stated, at some of the association meetings during the past year, "advancement in operative and surgical dentistry has ceased" for the time being, then we hope the time has arrived when those men who have used all their talents in that direction, will look about for the means to elevate mechanical dentistry.

The two branches cannot be separated by the general practitioner. Isolated cases may exist, and no doubt do in large cities where the one may be practiced independent of the other, but even in these few cases the operative dentist is called upon to correct irregularities, insert pivot teeth and perform other operations which require the highest order of mechanical ability. That time will never arrive when the dentist with a country or small town practice can separate the one from the other, and the college which sends a graduate into the field incapable in this direction, is not only doing the *individual* injury, but possibly an entire community. The profession has experienced little difficulty in educating themselves, as well as their patrons, to appreciate a better and higher class of operations upon the natural organs, as well as to a higher remuneration for such services. An equal ambition to excel in the mechanical department, the same unity of purpose to elevate, with a more thorough and determined stand in our schools, would soon make an exhibit in this direction of which we should feel proud.

Mechanical dentistry is not to be elevated by being made a specialty. I believe the man who operates upon the teeth of a family for years, is the one best calculated to provide the substi-

tute when required. Knowing as he must all the characteristics of the natural organs once possessed, as well as the expressions of the face and mouth, with natural organs intact, he is best fitted to reproduce them. Neither is it to be elevated by being left entirely to the student or the boy who may be employed to sweep the office and do the dirty work of the laboratory.

But those men who pride themselves in their ability to restore a defective natural organ to its original form with metal, as well as the teachers in our schools who claim to place the young practitioner upon the road to fame and fortune, these are the men who by their precepts and works must set the example and thereby elevate or resurrect this almost dead arm of dentistry.

In short, it must be elevated by what is taught, instead of a neglect to teach those entering the profession.

REPORT OF THE

Committee on Appliances.

THE committee on dental appliances beg leave to submit the following hasty report of such new and improved articles as have been presented for their consideration. They have had little time for examination, and therefore propose to do little more than merely mention briefly the names of such appliances, leaving their merits or defects to be brought out by discussion.

Ransom's vulcanizer possess the new feature of a self-packing arrangement and a gravity safety valve, both of which commend themselves by their simplicity and their probable effectiveness.

A floss holder for the pocket, for office use, presented by Codman & Shurtleff, seems to be worthy of notice and adoption.

Johnston Bro.'s present an instrument for separating teeth, the invention of Dr. O. A. Jarvis, of New York, which promises to be a valuable adjunct in operative dentistry, doing away with much of the inconvenience of the usual system of wedging. They also present a little tongue and cheek protector, invented by Dr. Ives, of New York, designed to be used in conjunction with the corundum discs. We are of the opinion that it may be very useful in many cases.

The same firm present separating files made with a corrugated handle, enabling them to be held between the fingers with greater ease and steadiness.

They also present a set of rubber dam clamps, designed by Dr. Delos Palmer, of New York, which are ingeniously adapted to the purpose. Something of this kind is of course indispensable to the best use of the dam.

A triplex arrangement of hollow punches, suggested by Dr. F. W. Dolbeare, of Brooklyn, for use with the rubber dam, can be commended as simple and very convenient.

Dr. E. Osmond presents improved retaining screws for securing fillings. They seem to possess advantages over the ordinary screw in having a head that may be split and bent down upon the filling. The driver, which is supplied with the screws, is also improved over that heretofore made.

A set of four scalers, presented by Johnston Bro.'s, were examined by your committee. We deem them a useful little instrument for the purpose intended, and think them worthy the attention of the profession.

Dr. Canine, of Louisville, Ky., presents three forceps, two of which are for the inferior molars, one of these being of the style called the "Cowhorn," the third instrument being for the extraction of superior molar roots. These forceps seem to your committee to possess considerable merit, and we think will prove useful in many cases where other forceps for the same purpose may fail, yet there may be some improvement still made upon them, and such improvements the inventor assures us will be made; his samples having been very hurriedly constructed, they hardly do justice to their devisor.

A variety of burs, both for the straight and back-action hand piece of the Morrison engine, were presented by the same party. These your committee gave a pretty thorough trial, and unhesitatingly recommend them as being of fine material and excellent temper.

A variety of excavators, also presented by Dr. Canine, were brought before us and receive favorable mention, and should the manufacturer continue to make them as well as the samples presented, we think that they will be found to merit the confidence of those using them.

A variety of polishing stones, to be used with the dental engine, were presented by Dr. Baxter. These having been seen and used by most dentists throughout the country, we can hardly consider as new. We would advise those who have not done so, to get them and give them a trial, for they very perfectly meet the design for which they are intended.

Dr. S. C. Taylor, of Toledo, O., presented for our consideration and examination his new process for packing rubber in the manufacture of artificial plates. This we consider the very best means thus far devised for this purpose, and it only seems strange that so simple a mode should have remained so long undiscovered. The object intended to be gained is to so pack the rubber that when the flask is ready to be placed in the vulcanizer, there shall neither be a surplus or a deficiency, and this end we think will be fully accomplished by the process of Dr. Taylor. To give a full description of his mode would take more time than is at our command. Those wishing to further examine into its merits are advised to confer with the inventor and patentee.

S. S. White has presented before this committee the following articles for examination:

1st. White's engine. This upon examination we find to be a very valuable improvement as regards the pitman and flexible arm; the first being a steel spring which works very noiselessly and smoothly, never stopping upon the center, while the flexible arm allows a most perfect control of the hand-piece in operating.

2d. White's hydraulic lift as attached to the Harris chair. This improvement seems to work very smoothly and with little noise, and accomplishes the end desired with very little effort.

3d. White's air cushion in back of chair. This has its merits, but to your committee does not seem entitled to especial commendation.

4th. The same inventor also presents for our consideration and examination his changeable seat and extension back rest, both of which must be seen to be appreciated.

5th. A vulcanizer so designed that it may be set to run at any given pressure of steam, and once having been set will not vary from that point. This improvement we commend to your favorable notice.

6th. Green's electric engine as improved by White, which we most heartily recommend to the dental profession, or such of them as do not employ an assistant at the chair. Time forbids a protracted explanation of its merits.

Your committee have had their attention called to the Bonwell electro-magnetic plugger, and have seen the same in operation. It is a beautiful instrument, and to be appreciated must be

seen. It does its work well, and their seems to be no deficiency in power. As to whether the *noise* caused in its running would be an objection, we are not prepared to say.

S. S. White also presented some hard rubber disks to be used in the polishing of proximate cavities, that are highly spoken of by those that have used them, and we commend them to your notice.

Dr. H. M. Edson, of Toledo, presented to your committee for their examination an improved vulcanizer, the principal feature of which was an arrangement by which the flasks may be brought together after being placed in the vulcanizer, and the top screwed down. This is a very neat device, and it is so arranged that there shall be no strain come upon the bottom of the boiler during the operation, it being obviated by the flasks being set in a stirrup which is drawn up by the screw packer towards the top of the vulcanizer when the pressure in the boiler stands at eighty-five pounds, by a few turns of the screw, and a more perfect closing thereby.

GEORGE L. FIELD,
G. R. THOMAS,
ALBERT H. BROCKWAY, } *Committee.*

VOLUNTEER ESSAY.

Asphyxia from Chloroform,

By J. DOUGLASS.

Romeo, Mich., November 20, 1857.

DR. C., an eminent physician, came into my office and said to me, "I have made up my mind that I must either lose my wife or consent to her taking chloroform to have her teeth out; her health has been failing for the last two years in consequence of continual suffering from facial neuralgia; she has palpitation of the heart, though I think it is caused by nervousness. However, I do not wish you to be biased by my opinion; act your own judgment in the matter; I may be influenced by over-anxiety." I said, "Bring her in, and I will decide after due examination." In a few minutes he returned with his wife and a lady friend. Mrs. C. was about twenty-eight years of age, had been married five years, no children, had very light brown hair, light blue eyes, fair skin, nervous temperament. Examination revealed no organic disease of the heart, lungs were good, and aside from an extremely nervous condition, she seemed a fit subject for an anæsthetic. As there appeared to be no prospect of improvement by waiting, I proceeded to give her chloroform. When she had taken nearly enough to go into a sound sleep, she suddenly became excited with uncontrollable fear. The chloroform was suspended until its effect had passed off, when she asked why I had not extracted her teeth. I replied, "I told you that if you would trust yourself in my hands I would not hurt you, but I saw you had no confidence in me; I do not want to

give chloroform to any one who cannot confide in me." My reply had the desired effect; for she said, in an unmistakable tone of voice, "I have as much confidence in you as in any one with whom I am no more acquainted; will you not give me any more?" Said I, "Yes, if you can trust me." "I think I can," she said in a very firm tone, whereupon the chloroform was resumed.

She breathed it easily as before, and everything went on pleasantly, as before, until she arrived at about the same stage, when she became excited as before, and said, "I am afraid you will hurt me." "No, I won't," said I, firmly, which seemed to remove all fear; then all went on well till she appeared in a proper anæsthetic state; but immediately when I attempted to extract a tooth she commenced to scream at the top of her voice, and before I could seize another, she resisted with both hands. I gave her two or three breaths more of chloroform and removed another tooth, but with the same out-cry and the same resistance. I gave two or three additional breaths and extracted a third, and proceeded in this manner until seventeen had been extracted; I then said to the Doctor that if he would hold her hands I would repeat the anæsthetic but once more, and then extract the remaining three—not thinking it advisable to continue it longer, although the pulse was good in the wrist and neck, ranging from fifty to sixty. She continued screaming during the entire operation, and about half a minute after it was completed, then falling into a sound chloroform sleep, which lasted about a minute and a half, and during which her breathing was easy and pulse sixty. She awoke of her own accord, and asked, "Where is the Doctor?" and turning toward him said, "Oh! here you are!" In a few moments she asked me in a clear, distinct voice, "Are the teeth all out?" Not thinking it would do any harm, I replied in the affirmative. The moment she comprehended the fact, a perfect relaxation occurred. The lower jaw hung down, the eyes partly closed, a deathly palor spread over her countenance; she ceased breathing, the pulse in the neck and wrist were gone; to all appearance she was dead. Before administering the chloroform her dress had been unfastened and covered with a napkin; a glass of cold water was standing on my operating case, and a bottle of ammonia ready for use; the moment

the change in her countenance occurred, I threw a part of the glass of water in her face and part on the naked breast. I then made use of the ammonia, but it was all in vain—she had ceased to breathe. Just then flashed across my mind a discovery once made while using Davis & Kidder's electro-magnetic machine in a case of rheumatism of the intercostal and abdominal muscles. I found that placing a pole on either side directly under the arms and opposite the edge of the diaphragm, caused a violent beating of the heart and a deep, hurried breathing. I said to myself, "It is just what I want!" and sprang for it as for life. It was standing on a table about fifteen feet from my operating chair, the cords wound around the handles and placed inside the box, the crank unscrewed and inside the box also, and the box locked.

While her lady friend and her husband were weeping over their bereavement, I put the machine in order and commenced turning the crank, when suddenly, with the first revolution, the pulse reappeared in the neck, and with it a deep triple sigh; in a few moments her eyes opened—she that was dead lived again. I say dead, for from the time the relaxation occurred, till the application of electricity, there was no sign of life.

In ten minutes from the time I told her the teeth were all out, she was standing by the stove not aware that anything unpleasant had occurred, and remarking that she felt better than she had before during the past three months.

CAUSE OF THE PHENOMENON.

Any stimulant serves as an antidote to chloroform to a greater or less degree, according to its nature, whether it be medicinal or mental. In her case it was the mental stimulant *fear*, preventing the more perfect anæsthetic condition which might otherwise be obtained, without reducing the pulse to a perilous condition. When I answered her question regarding the operation in the affirmative, it was like removing the last prop from a scaffold—the stimulant was removed, while without it she had a sufficient amount of chloroform left in her system to carry her into the land of forgetfulness. The interposition of electricity induced action of the heart and lungs, and kept them in operation until it was no longer needed. This lady is still living, having survived her husband many years.

[The Essay continued with an account of another and somewhat similar case of resuscitation by means of the battery, and closed as follows:]

Having seen many articles on resuscitation from anæsthetical asphyxia, and not having learned that electricity had been used for that purpose previous to the time mentioned, or applied in the same way since, I could no longer let my diffidence prevent me from reporting these cases.

1875.

TRANSACTIONS

OF THE

American Dental Association

AT ITS

FIFTEENTH ANNUAL SESSION,

HELD AT

NIAGARA FALLS, N. Y.

Aug. 3, 4, 5, and 6, 1875.

SPRINGFIELD,
STATE REGISTER PRINTING HOUSE.
1875.

1875.

TRANSACTIONS

OF THE

American Dental Association

AT ITS

FIFTEENTH ANNUAL SESSION

HELD AT NIAGARA FALLS,

August 3d, 4th, 5th and 6th, 1875.

PUBLICATION COMMITTEE:

C. STODDARD SMITH, G. H. CUSHING, G. C. DABOLL.

SPRINGFIELD, ILLS:
STATE REGISTER STEAM PRINTING HOUSE.
1876.

BOSTON MEDICAL
AUG 7 1903
LIBRARY.

The American Dental Association, although formally accepting and publishing the reports of the various Standing Committees, and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution.—*Constitution.*

ERRATA.

Page 83, second line from top, for "Hch." read "4 Hcl."

Page 84, near close of first paragraph, for "oxalate acid," (over 2 C, H_2 O_4) read "oxalic acid."

CATALOGUED
AUG 7 1903
J. F B.

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Committee on Credentials.—G. H. CUSHING, *Chairman;* M. H. WEBB, G. C. DABOLL.

Committee on Nominations.—L. D. SHEPARD, *Chairman;* T. L. BUCKINGHAM, S. B. PALMER.

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MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION,

SESSION OF 1875.

BY C. STODDARD SMITH, SECRETARY.

GRANT'S HALL, NIAGARA FALLS,)
August 3rd, 1875.)

THE fifteenth Annual Session of the AMERICAN DENTAL ASSOCIATION convened at the above time and place, and was called to order at 10:30 A. M. by the President, Dr. M. S. DEAN.

The roll was called and the following delegates and permanent members were reported as having paid their dues, those marked with an * not being present, but forwarding their dues:

F. ABBOTT.....78 West Twelfth St., New York.
JOHN ALLEN.....314 Fifth Avenue, New York.
W. H. ALLEN.....18 W. 11th St., New York.
CHAS. F. ALLEN.....Newburg, New York.
*H. L. AMBLER.....114 Euclid Ave., Cleveland, O.
*J. J. ANDERSON.....Springfield, Mass.
W. H. ATKINSON.....41 East Ninth St., New York.
J. M. AUSTIN.....76 Felix St., St. Joseph, Mo.

W. C. BARRETT,.....Warsaw, N. Y.
W. A. BARROWS,.....Buffalo, N. Y.
C. H. BIDDLE,.....133 Pacific St., Brooklyn, N. Y.
H. J. BILLING.....Louisville, Ky.
*J. J. BIRGE.....San Francisco, Cal.
C. A. BRACKETT,.....113 Thames St., Newport, R. I.
A. H. BROCKWAY,.....13 Green Ave., Brooklyn, N. Y.
*W. A. BRONSON,.....8 East 34th St., New York.
SENECA B. BROWN,.....Fort Wayne, Ind.
*L. BUFFETT,.....Cleveland, Ohio.
C. R. BUTLER,.....114 Euclid Ave., Cleveland, O.

J. F. CANINE, ...Louisville, Ky.
J. S. CASSIDY,.....Covington, Ky.
THOS. H. CHANDLER,.....222 Tremont St., Boston.
*M. L. CHAIM,.....30 Cooper Institute, N. Y.
THOS. COGSWELL,.....Boston, Mass.
*C. D. COOK,.....133 Pacific St., Brooklyn, N. Y.
*AARON COLTON,.....Hudson, N. Y.
*J. N. CROUSE,.....652 Wabash Ave., Chicago.

G. C. DABOLL,.....Buffalo N. Y.
M. S. DEAN.....174 State St., Chicago.
*S. W. DENNIS,.....San Francisco, Cal.
*D. S. DICKERMAN,.....Taunton, Mass.
*R. B. DONALDSON.....413 Penn. Ave., Washington, D. C.
*B. OSCAR DOYLE,.....Louisville, Ky.
*I. DOUGLASS, ...Romeo, Mich.
CHAS. E. DUNN,.....Louisville, Ky.

GEO. E. ELLIOT,.....Meadville, Pa.
C. D. ELLIOT,.....Franklin, Pa.

GEO. L. FIELD,.....Campus Martius, Detroit, Mich.
J. FOSTER FLAGG,.....Philadelphia, Pa.
*S. A. FREEMAN,.....416 Main St., Buffalo, N. Y.

E S. GAYLORD,.....New Haven, Ct.
W. H. GODDARD, ...65 West Walnut St., Louisville, Ky.

A. W. HARLAN, ...Randolph St., Chicago.
D. C. HAWXHURST,.....Battle Creek, Mich.
F. HERRICK.....Greenville, Pa.
J. L. HILL,.....Gettysburg, Pa.

*E. HONSINGER,.....318 Park Ave., Chicago.
F. A. HUNTER,.....192 7th St., Cincinnati, O.
E. HUNTER,.....Manchester, Mich.
P. G. C. HUNT,.....Indianapolis, Ind.
E. S. HOLMES,.....Grand Rapids, Mich.

*J. K. JAMISON,.....Connersville, Ind.

GEO. W. KEELY,.....Oxford, Ohio.
D. E. KELLY, ...Ashtabula, O.
G. W. KLUMP,.....Williamsport, Pa.
I. KNAPP,.....Fort Wayne, Ind.

H. K. LATHROP, JR.,.....153 Woodward Ave., Detroit, Mich.

W. E. MAGILL,.....Erie, Pa.
*J. FRANK MARRINER,.....Ottawa, Ills.
W. N. MORRISON,.....St. Louis, Mo.
W. H. MORGAN,.....Nashville, Tenn.
HENRY W. MORGAN.....Nashville, Tenn.
W. S. MOORES, ...Maysville, Ky.
B. R. MCGREGOR,.....Rochester, N. Y.
H. J. MCKELLOPPS,.....St. Louis, Mo.
JAS. MCMANUS,.....Hartford, Conn.
J. T. MCMILLAN,.....Paris, Ky.
J. H. MCQUILLEN,.....2100 Arch St., Philadelphia, Pa.

*H. B. NOBLE,.....1111 Penn. Ave., Washington, D. C.
L. G. NOEL,.....Nashville, Tenn.
A. L. NORTHROP,.....44 West 46th St., New York.

F. M. ODELL,.....18 West 11th St., New York.
E. OSMOND,.....216 Vine St., Cincinnati, O.

CORYDON PALMER.....New York.
S. B. PALMER,.....Syracuse, N. Y.
*C. N. PIERCE,.....501 North 7th St., Philadelphia.
W. PINNEY,.....Newark, N. J.

A. O. RAWLS,.....Lexington, Ky.
L. E. READING, ...Trenton, N. J.
F. H. REHWINKEL,.....Chillicothe, O.
H. M. REID,.....Cincinnati, O.
F. J. RICHARDS,.....Williamsport, Pa.

*H. L. SAGE,.....Bridgeport, Ct.
*J. N. SCRANTON,.....Bennington, Vt.
L. D. SHEPARD,.....Hotel Boylston, Boston.
F. N. SEABURY,.....Providence, R. I.
C. STODDARD SMITH,.....Springfield, Ill.
D. D. SMITH,.....147 Walnut St., Philadelphia, Pa.
J. H. SMITH,.....New Haven, Conn.
H. A. SMITH, ...286 Race St., Cincinnati, O.
A. W. SMITH,.....Richmond, Ky.
JOHN STEPHAN,.....85 Michigan St., Cleveland, O.
C. S. STOCKTON,.....15 Cedar St., Newark, N. J.
J. S. SWARTLEY,.....749 Michigan Ave., Chicago.
*E. D. SWAIN,.....67 Washington St., Chicago.

J. TAFT,.....117 West 4th St., Cincinnati, O.
T. C. TIERNAY,.....107 West 41st St., New York.
L. C. TAYLOR,.....57 Church St., Hartford, Conn.
G. R. THOMAS,.....Detroit, Mich.
W. LEWIS TUCKER,.....11 Ashburton Place, Boston.

W. T. WALLACE,.....Kingsville, O.
*G. F. WATERS,.....8 Beacon St., Boston, Mass.
M. H. WEBB,.....Lancaster, Pa.
MERRITT WELLS,.....Indianapolis, Ind.
*C. F. WHEELER,.....Albany, N. Y.
F. S. WHITSLER,.....Youngstown, O.
*J. C. WHINERY,.....Salem, Ohio.
E. M. WOLFE,.....Oil City, Pa.

Back dues were received from the following members:

CHAS. MERRIT, (for 1874).....25 West 23d St., New York.
J. G. AMBLER, (for 1874).....25 West 23d St., New York.
GEO. T. MOFFATT, (for '73–'74).....Boston, Mass.
H. H. PIERSON, (for 1874).....Sacramento, Cal.

The reading of the minutes of the last meeting was proceeded with, but on motion, the further reading was dispensed with.

The Committee on Credentials made a partial report, which as amended by various supplemental reports, was accepted and adopted as follows:

American Academy of Dental Science—F. N. Seabury, W. L. Tucker, L. D. Shepard.

Chicago Dental Society—M. S. Dean, A. W. Harlan.

Connecticut Valley Dental Society—J. H. Smith, C. A. Brackett.

Connecticut State Dental Association—L. C. Taylor.

Dental Society of the State of New York—W. C. Barrett, G. C. Daboll, S. A. Freeman, S. B. Palmer.

Dental Society of the First Judicial District of the State of New York—F. M. Odell, T. C. Tierney.

Dental Society of the Eighth Judicial District of the State of New York—W. A. Barrows.

Illinois State Dental Society—C. Stoddard Smith.

Indiana State Dental Association—S. B. Brown, M. Wells.

Kentucky State Dental Association—J. T. McMillan, H. J. Billing, A. O. Rawls, W. S. Moores, A. W. Smith.

Lake Erie Dental Association—W. E. Magill, D. G. Kelly, C. D. Elliot, F. Herrick.

Massachusetts Dental Society—T. Cogswell.

Mississippi Valley Dental Association—F. A. Hunter.

Missouri State Dental Association—W. N. Morrison.

New Jersey State Dental Society—C. S. Stockton, W. Pinney.

Odontographic Society of Pennsylvania—M. H. Webb, J. F. Flagg, L. E. Reading.

Odontological Society of New York—A. L. Northrop,.

Ohio Dental College Association—H. J. McKellops.

Pennsylvania State Dental Society—J. H. McQuillen.

Susquehanna Dental Association—Geo. W. Klump.

Tennessee State Dental Association—Henry W. Morgan.

Dental School of Harvard University—T. H. Chandler.

Philadelphia Dental College—D. D. Smith.

Ohio Dental College—H. M. Reid.

Miscellaneous business being in order, certain resolutions and amendments to the Constitution lying over from last year were taken up and acted upon.

The following amendment proposed by Dr. Shepard:

Add to article IV the clause: "The Executive Committee shall have power to change the place determined upon for the regular meeting for extraordinary reasons; notice of such change to be published in due season,"

was, after discussion, withdrawn by the mover.

The two following amendments, offered by Dr. Cushing, were carried:

Amend Article V, Section 6, under head of "Sub-Committees—First Division, —Committee of Arrangements," by striking out these words: "if practicable reside at or near the place at which the Association is to hold its next annual meeting, and shall"

Amend Article IV by adding this clause: "After the selection of a place of meeting, there shall be appointed by the President, annually, a committee of three, residing at or near the place selected for the next meeting, whose duty it shall be to procure rooms for meetings, clinics, and for the exhibition of mechanical appliances, and to make such other local arrangements as may be needed for the Association. This committee shall act under the direction of the first Division of the Executive Committee."

An amendment to Article V Section 1, proposed by Dr. Stockton, was laid on the table.

An amendment to Article III, Section 4, offered by Dr. Allport, was discussed by several gentlemen. Dr. Morgan offered a substitute, which, upon leave, was withdrawn subsequently, after which the amendment was adopted as follows:

Amend Art. III, Sec. 4, by adding the following:

This Association will hereafter receive no delegate, who shall, after this date, enter the profession without first having graduated at some reputable dental or medical college.

An amendment offered by Dr. McQuillen, increasing the number necessary to form a quorum, was lost.

The following resolution, offered last year by Dr. Bogue, was taken up and put to vote, and carried as follows:

Resolved, That it is the sense of this Association that no dental student should be graduated from any dental college without at least three years instruction, including private pupilage and college instruction; the latter should in no case embrace less than two full regular courses.

Another resolution on the same subject, offered by the same gentleman, was lost.

The following, offered last year by Dr. Judd, was, after discussion, adopted, as follows:

Resolved, That this Association recommends to all local societies the adoption of rules prohibiting their members from taking students for a less period than three years, or for such time as will complete a three years pupilage.

An invitation to visit certain objects of interest was accepted, and thanks tendered to the author.

A complimentary tender of the privileges of the floor was extended to Dr. Wilson, of Cuba, and any others from foreign countries who might be present.

The regular reports of committees were then called for; but those called not being ready, the Association adjourned till 7.30 P. M.

FIRST DAY—EVENING SESSION.

The Association was called to order at 7.45 P. M., the President in the chair. The minutes of the morning session were read and approved. The report of the Treasurer was read as follows, and referred to the Executive Committee:

WM. H. GODDARD, IN ACCOUNT WITH AMERICAN DENTAL ASSOCIATION.

August 5th, 1874.		
Dr. To Balance in my hands		$213 23
Cash Dues, for 1872	15 00	
" " " 1873	95 00	
" " " 1874	615 00	
		$725 00
August 5th, 1874.		
Dr. By paid Voucher No. 1	$100 00	
" " No. 2	213 98	
" " No. 3	120 00	
" " No. 4	511 35	
" " No. 5	250 00	
" " No. 6	14 15	
	$748 48	
August 3d, 1875.		
To Balance this day	$189 75	
	$938 23	$938 23

WM. H. GODDARD, *Treasurer.*

NIAGARA FALLS, N. Y. *August 3d, 1875.*

We have examined the Treasurer's Report and find it correct.

L. D. SHEPARD,
S. B. PALMER,
A. L. NORTHROP. } *Committee.*

The Committee on Physiology was called, but the chairman not being present it was moved by Dr. H. A. Smith that Dr. John Allen be invited to read a volunteer essay upon that subject, and the motion prevailed. Dr. Allen then read his paper, and closed by offering the following resolution, which was adopted:

Resolved, That a committee of three be appointed, whose duty it shall be to collect facts with reference to the subject matter here presented, and also the best means of preserving the physical and mental capacity of dental practitioners.

The chair subsequently announced Drs. John Allen, W. H. Morgan and W. E. Magill, as the committee provided for in the resolution.

The report of the Committee on Physiology was then read by the Chairman, Dr. McQuillen, and the subject being open for discussion, it was discussed by Drs. Atkinson, McQuillen, Magill, Flagg, Taft and Rehwinkel, after which the meeting adjourned.

SECOND DAY—MORNING SESSION.

The Association was called to order by the President; the minutes were read and approved.

The subject of Physiology was then resumed and discussed by Drs. Taft, Morgan, Barrett, McQuillen, Rehwinkel, Allen, Shepard, Flagg, and Atkinson, after which the subject was passed.

The rules were suspended to hear reports from the Executive and Publication Committees.

The Executive Committee recommended that the afternoons be devoted to Clinics. Adopted.

The Publication Committee submitted the following report, which was accepted:

The Publication Committee have to report, that in accordance with instructions contained in the resolution of Dr. Allport, adopted last year, they have had printed 250 copies of the Transactions of the last session, which have been bound in paper covers. They have been distributed to those entitled to them, and to the various journals of this and foreign countries, and about ninety copies now remain on hand.

The amount expended as per bills for printing proceedings and other printed matter, is as follows:

Printing Transactions		$212 00
Printing Postal Cards, &c.		2 50
		$214 50
Postage, Express, Wrapping, &c		24 55
By Cash from Treasurer,	$250 00	
" " Books sold	10 00	
	$260 00	
Balance in hands of Committee	20 95	
	$239 05	$239 05

Some complaint has reached the Committee in regard to the binding in paper covers only, the impression having apparently existed that the Committee bound them in this manner of their own choice. They beg leave therefore to call attention to the fact that that under the resolution already referred to, they had no discretion in the premises, but were confined to paper covers.

The Committee have also to say in apology for the somewhat late day at which the Transactions appeared, that the publication was conducted under peculiar difficulties, not liable to again occur. They would also say, that while the expense of publication was very low, considering the execution of the work and the quality of paper, yet the small number of copies ordered (250) makes the cost per volume much larger than it would have been had a larger number been ordered. For an additional sum, of say $50, the number of copies could have been doubled, and the price placed at 50 cents to 75 cents, instead of $1, as at present, and the Committee suggests for your consideration whether the dissemination of the Transactions by such a method, is not an object worthy of being aimed at.

C. STODDARD SMITH,
L. D. SHEPARD,
A. H. BROCKWAY. } *Publication Committee.*

Dr. Atkinson moved that the Publication Committee be instructed to publish 500 copies of the Transactions; but accepted an amendment to leave the number to the discretion of the Committee, and the motion as amended was, after discussion, carried.

A motion was made and carried, that in future the Dental Depots be requested to close their doors during the sessions of this body.

The regular order of business was then taken up and proceeded with.

There being no papers on the subject of Pathology and Surgery, that subject was postponed.

The Committee on Histology and Microscopy was called, and Dr. Taft, Chairman, read reports written by Dr. W. H. Jackson, of Ann Arbor, and Dr. E. D. Swain, of Chicago.

The subject was discussed by Dr. Atkinson, and the meeting adjourned.

SECOND DAY—EVENING SESSION.

The meeting was called to order by the President at the usual time. The minutes of the morning session were read and approved.

The subject of Histology and Microscopy was still before the Association, and was discussed by Drs. McQuillen and Atkinson. The subject was then passed.

The Committee on Chemistry was then called, and Prof. H. A. Smith read a report, which was discussed by Dr. Palmer, and the meeting adjourned.

THIRD DAY—MORNING SESSION.

The Association was called to order at the usual time by the President. The minutes were read and approved.

It was moved and seconded that one o'clock to-day be fixed for the election of officers. Carried.

Dr. Goddard offered the following, which was adopted:

Resolved, That the Publication Committee compile all the amendments passed since our Constitution was printed, and have not exceeding 1000 copies re-printed for the use of this Association.

Dr. J. H. Smith moved the appointment of a committe of three to prepare a resolution on the death of Dr. Asa Hill. The motion was carried, and the President appointed as such committee, Drs. J. H. Smith, Frank Abbott, and A. W. Harlan.

A resolution providing for the appointment of a committee to confer with a like committee of the American Dental Convention. in regard to the propriety of a joint meeting of the two bodies in Philadelphia next year, was laid on the table.

The subject of Dental Chemistry was then resumed, and discussed by Drs. Hunter, Palmer, Taft, Chandler, Osmond, Rehwinkel, and Daboll, and the subject was passed.

The subject of Dental Therapeutics was passed, there being no report presented by the Committee.

The subject of Operative Dentistry was then taken up, and Dr. Stockton read a report written by himself, and also one by Dr. McCall.

The subject was then discussed by Drs. Barrett, Taft, Atkinson, Abbott, McKellops, Rehwinkel, Morgan, and Rawls.

The hour for the special order, election of officers, having arrived, that business was proceeded with, with the following result:

President—A. L. NORTHROP, New York City.
First Vice-President—H. J. MCKELLOPS, St. Louis.
Second Vice-President—H. A. SMITH, Cincinnati.
Corresponding Secretary—J. H. MCQUILLEN, Philadelphia.
Recording Secretary—C. STODDARD SMITH, Springfield, Ill.
Treasurer—W. H. GODDARD, Louisville, Ky.
Executive Committee—(New Members) L. D. SHEPARD, T. L. BUCKINGHAM, M. H. WEBB.

It was then moved and seconded that the action of this body in 1872, fixing the place of meeting in 1876 at Philadelphia, be ratified. Carried.

On motion of Dr. Goddard, the following resolutions were adopted:

Resolved, That the Treasurer notify all permanent members of their arrearages and of the necessity of paying the same.

Resolved, That the Treasurer pay the bills of the Committee of Arrangements and salaried officers.

The meeting then adjourned.

THIRD DAY—EVENING SESSION.

The Association was called to order by the Vice-president, Dr. Keely, at the usual hour. The minutes were read and approved.

The subject of Operative Dentistry was still open, and was discussed by Dr. Rawls, Butler, Abbott and Flagg, after which an adjournment was had till the following morning.

FOURTH DAY—MORNING SESSION.

The Association convened at the usual hour, Vice-president Keely in the chair.

Upon motion of Dr. Flagg, certain remarks made by himself last evening, in reference to amalgam, were ordered expunged from the records.

The regular order of business was then resumed, and the subject of Mechanical Dentistry was taken up.

Dr. Rehwinkel read the report of the Committee, and the subject was discussed by Drs. Rehwinkel, Stockton, D. D. Smith, and Barrett.

The subject was then passed, and the regular order was suspended to enable the Committee on Appliances to make a report, which they did, and the same was received.

Dental Education was then taken up, and Dr. Keely read the report of the Committee, and was followed by Dr. Flagg, who read a volunteer paper upon the same subject.

The subject was then discussed by Drs. Shepard, McQuillen, Atkinson, Abbott, and Flagg. The subject was then passed.

The subject of Dental Literature was then taken up and a report read by the Chairman, Dr. I. Knapp.

There being no discussion, the next subject, Pathology and Surgery, was taken up, and there being no reports, it was discussed by Drs. Atkinson and Taft, and the subject was passed.

The Nominating Committee presented the following as the list of Standing Committees for the ensuing year, which, upon motion, was concurred in.

Physiology—J. H. McQuillen, S. W. Dennis, A. H. Brockway.
Pathology—J. Foster Flagg, L. D. Shepard, I. Knapp.
Chemistry—S. B. Palmer, J. S. Cassidy, L. G. Noel.

Therapeutics—W. H. Atkinson, C. A. Brackett, C. R. Butler
Operative Dentistry—Frank Abbott, A. W. Harlan, H. M. Reid.
Mechanical Dentistry—W. N. Morrison, D. D. Smith, W. C. Barrett.
Dental Education—W. H. Morgan, J. N. Crouse, Merritt Wells.
Dental Literature—M. S. Dean, G. C. Daboll, E. S. Gaylord.
Etiology—D. C. Hawxhurst. M. H. Webb, H. L. Sage.
Prize Essays—F. H. Rehwinkel, G. W. Keely, H. J. McKellops.

The committee appointed to draft resolutions on the death of Dr. Hill, of Norwalk, reported the following, which, upon motion, was adopted and ordered inserted in the forthcoming volume of Transactions upon a memorial page.

Whereas, This Association has with sorrow learned of the death of our brother Dr. ASA HILL, of Norwalk, Conn., therefore,

Resolved, That we signify in this public manner our sense of the great loss which the dental profession has sustained, and that we sincerely smypathize with his family in their loss.

Resolved, That these resolutions be inserted in our minutes, and that the Secretary be instructed to forward a copy of the same to the family of the deceased.

J. H. SMITH,
FRANK ABBOTT, } *Committee.*
A. W. HARLAN.

The following resolution was then adopted:

Resolved, That the Treasurer be authorized to pay the drafts of the Publication Committee as required.

The meeting then adjourned until 4 o'clock P. M.

FOURTH DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the Vice-president in the chair.

The subject of Etiology being called, a letter from Prof. Chase, Chairman of the Committee, was read by the Secretary, stating that he was engaged in investigations on the subject, the result of which he was not prepared at the present time to report. Ordered filed.

The subject of Therapeutics was then taken up, and was discussed

by Drs. Atkinson, Taft, W. H. Allen, Stockton, Osmond, Flagg, Shepard, Abbott, Knapp, Butler, C. S. Smith, and Harlan, and the subject was passed.

The Committee on appliances made a supplemental report, which was received.

Dr. Abbott, after some informal discussion on the subject of appliances, moved that we have no clinics hereafter in connection with the meetings of this Association. After some further discussion, Dr. Atkinson moved to amend the motion by substituting the words, "that a vote of thanks be tendered to the clinical operators, Drs. Webb, Bonwill, Gaylord and Klump, who had added so much to the interest of the meeting." Carried.

Upon motion, the newly elected officers were installed, and Dr. A. L. Northrop, the President-elect, took the chair with appropriate remarks.

A vote of thanks was tendered to the retiring officers, and to Dr. Southworth, for the faithful discharge of their duties; also to the hotels for reduced rates.

Dr. Keely made a verbal report as Chairman of the Committee on the Barnum Testimonial Fund. He stated that the Committee had not been able to close up the business, as they had hoped, and requested further time, which was granted.

The President announced as the special Committee of Arrangements, acting under direction of the Executive Committee, Drs. McQuillen, Buckingham and Peirce.

Also as members of the Publication Committee, Drs. G. H. Cushing and G. C. Daboll.

Then, at 6 P. M., the Association adjourned to meet in Philadelphia on the first Tuesday in August, 1876.

In Memoriam.

WHEREAS, This Association has with sorrow learned of the death of our brother, Dr. ASA HILL, of Norwalk, Conn., therefore,

Resolved, That we signify in this public manner our sense of the great loss which the dental profession has sustained, and that we sincerely sympathize with his family in their loss.

Resolved, That these resolutions be inserted in our minutes, and that the Secretary be instructed to forward a copy of the same to the family of the deceased.

J. H. SMITH,
FRANK ABBOTT, } *Committee.*
A. W. HARLAN.

REPORTS

OF

STANDING COMMITTEES

VOLUNTEER ESSAYS

AND

DISCUSSIONS.

VOLUNTEER PAPER

ON THE

EXHAUSTIVE EFFECTS OF DENTAL PRACTICE.

By J. ALLEN.

IN taking a retrospective view of the dental profession, we find that our responsibilities and duties are increased in a corresponding ratio to the advances that have been made. Much more is expected of the dentist now than formerly, and his qualifications are required to be commensurate with the duties devolving upon him.

Without going into detail as to the various requirements of the dentist of the present day, I would say that there is perhaps no profession or calling more arduous, or that taxes the mind and nervous system more severely than a heavy dental practice; and it is often the case that the tension and exhaustive effect upon the brain of the operator is so great, that one hour of a pressure so severe as that to which he is subjected, tells upon him more than a whole day of ordinary toil; and yet he is often required to endure it for several hours in succession, or perchance for the entire day, and this is repeated, perhaps, each succeeding day of the week; and as with days and weeks, so with months and years, or while his health and strength hold out. His toil is often rendered doubly irksome by personal contact with patients whose nervous temperament exhausts his own vital force at a rapid rate.

The following melancholy record presents a sad commentary in connection with this subject:

Dr. L. Parmley died insane.
Dr. Weir died insane.
Dr. Wells died insane.
Dr. Snow died insane.
Dr. Flagg died insane.
Dr. Barrot died insame.
Dr. Blakesly died insane.
Dr. Griffin died insane.
Dr. Westcott died insane.
Dr. Franklin died insane.
Dr. Whitney died insane.

These, and also many others that might be recalled, have lived and died in our day. Many of their voices have been frequently heard at our annual convocations by the older members now present.

Now, as our field of usefulness will compare favorably with any other of the present day, it becomes a matter of deep interest, not only to ourselves, but also to the community at large, that this subject should be presented for your consideration, with a view of ascertaining the best means of preventing a premature exhaustion of the vital forces of the dentist.

Various means have been resorted to by different members of our profession to counteract the deteriorating tendency upon the system. Some have resorted to narcotics, others to stimulants, others to entire abstinence from either, others to a systematic course of daily exercise and regular habits; but there are fundamental principles which underlie all theories upon this subject, and to some of these fundamentals we will now refer.

We have the promise that as our days so shall our strength be. This promise is based upon our obedience to certain fixed laws. The Creator has established laws for the government of all his works. We are of his works and he cares for us. Man has sought out many inventions, but none of these can supersede or annul the firmly established laws of nature, and the more careful we are to observe and fulfill the requirements of those physical laws which have been established for our welfare, the more we become the recipients of that strength which supports us physically as well as

spiritually in time of need. But as it is the temporal body that claims our attention at present, we will look at this subject from a professional stand-point, and as our remarks are addressed to a scientific body, let us follow that line of investigation, beginning at the foundation.

In your earlier days, when pursuing your anatomical and physiological studies, you learned that the human body is built up atom by atom, until the full stature of man is attained, numbering two hundred and forty bones, four hundred and eighty muscles, besides nerves, arteries, veins, brain, skin, &c., all of which are formed from some fourteen nutrient substances, which are contained in the food designed for man. These substances or aliments, you will recollect, are divided into four classes, viz: proteides, fats, amyloids and minerals. The proteides consists of albuminous or nitrogenous substances, including the gluten of wheat and other grains; the white of egg, the muscle of flesh, casein of cheese, &c. The fats include all oils, whether animal or vegetable, and are called the non-nitrogenous articles of diet, because they contain no nitrogen; the amyloids include sugar, starch, gums and dextrine. The minerals are the salts of magnesium, potassium, iron, lime, sodium and phosphorus. These, together with the gases and liquids, contain all the constituents of which the body is composed, and when taken into the system and converted into blood, are conveyed to all parts of the body, imparting to the nerves phosphorized compounds, to the muscles sulphurized compounds, and to the bones, teeth, &c., mineral compounds.

My object in recalling your attention to these primary studies is that they may serve as a basis from which to make practical deductions as to the physical and mental effects of the various substances taken into the human system.

We see from the foregoing summary that the constituents above named are all that are required to build up these temporal bodies of ours and sustain them in their normal state according to the fixed laws of nature. But man, as if to amend those laws, has introduced other substances into the system, which are not nutrient but detrimental when habitually used. These are called narcotics and stimulants, and consist of coca leaf, betel nut, tobacco, hemp, opium and alcohol. These are all more or less intoxicants, and are designated

by Orfila, Christison, Parker, Davis and others of the best writers and teachers on toxicology, as poisons, and are classed with arsenic, prussic acid, &c. They all have their places, and when judiciously administered to the sick, in small doses, act as mild stimulants and tonics, but in larger doses, as powerful irritants, producing madness, or as narcotics, producing coma and death.

Thus we find that the fourteen constituents embraced in the four classes of nutrients before named, are the proper materials for the construction and sustaining of the human body; and the Divine Architect was careful to employ not only just the kind of materials requisite, but also the due proportion of each constituent; and He also established certain physical and chemical laws, by means of which the nutrient substances, when taken into the system (in its normal state) are duly apportioned and appropriated to every part of the human organism, and thus the equipoise of waste and supply is maintained in time of health. But on the other hand we find that the additional materials introduced into the system by man's dictum, such as tobacco, stimulants, &c., are not nutrient materials from which cellular or fibrous tissues can be made or sustained; consequently they do not restore the vital forces which have been expended in the system in accordance with the laws of waste and supply, but serve only a temporary purpose.

Now in view of the facts here presented, we think a spirit of inquiry should be aroused in our profession, with reference to the cause of this peculiar fatality among our members. And first, is it owing to the exhaustive nature of our calling? Or, second, is it due to a course of habits, such as an excessive use of narcotics or stimulants, which an over-worked brain cannot withstand? Or, third, to a want of daily exercise in the open air?

We think the development of facts upon this subject will be productive of good results, and would therefore recommend that this matter be brought before the state and local societies, with a view of eliciting further information upon this subject, and in order to bring this question in a tangible form before this Association, I will now offer the following resolution:

Resolved, That a committee of three be appointed whose duty it shall be to collect facts with reference to the subject matter here presented, and also the best means of preserving the physical and mental capacities of dental practitioners.

[This resolution was carried (see minutes) and Drs. Jno. Allen, W. H. Morgan and W. E. Magill appointed as the committee provided for in the resolution. SEC.]

NOTE—After the reading of Dr. Allen's paper the report of the Committee on Physiology was read by the chairman, Dr. J. H. McQuillen. This paper the author declined to place in the hands of the Secretary at the time, and has not done so up to the time of going to press (Nov. 16th) although it was promised two months before; nor have repeated letters and telegrams elicited any response from the author, although the committee have evidence that the dispatches were received by him.

C. STODDARD SMITH, Sec'y.

DISCUSSIONS.

DR. ATKINSON: I rejoice that we are beginning to attempt the solution of principles; but I regret that we are following the old lead of endeavoring to get at different conditions by a repetition of some of the phases of those conditions.

We have before us a very large and interesting question, and it assumes two forms. All we have had thus far has been a description of some of the results of the action that has been denominated on the one hand, sleep, and on the other hand anæsthesia. Sleep has not been defined before us; it has been assumed that we understand what it is. If that were so, we might have arrived at a proper understanding of the paper; but without such preliminary understanding we cannot arrive at a proper conclusion.

Shall I attempt to define sleep, to point out the line of demarkation between that and the waking condition? Were I to say it is simply a polarization or depolarization of the elements of tissue, how many would understand what I mean? They would want to know what polarity is, and whether there is any such thing as polarization of the currents of the human body.

We are dealing with something not quite so tangible as a stone fence, when we undertake the explanation of physiological action; when we are dealing with the manifestations of the power that lies behind all organic relation, and ascertaining the line between what we term normal activity as contradistinguished from abnormal activity.

There is resident within the human organism a demand for a sufficient quantum of power to operate the functions of the body. So long as that power is supplied in full measure to operate efficiently, we are in a waking state, and it matters little how much activity is indulged in, provided the influx of the power can be maintained.

Generally speaking, men dwindle down into individual experience to prove such conditions. I, myself, in the practice of medicine, have been able for a number of consecutive weeks to keep up the normal activity without sleep in the sense of retiring for regular sleep. I am also the subject of neuralgia, which I incline to think was induced by insomnia, producing such a strain upon the nervous system that it did not fully recover its tone, and it is now necessary for my health to be above the normal standard of the quantum of power in the organism not to have a consciousness of pain all the time.

What we denominate consciousness is to have our mental attention sufficiently in harmony with the deranged condition to cognize it.

The explanation of the physiological processes involved in this question, to any one not conversant with the laws of generation of tissues, is exceedingly difficult. I will not say the generation of tissues, but rather the generation of the elements of the tissues. That generation consists in oxygenation, and it involves also oxydation.

There are some of the activities which have been called vital and chemical, and a great deal of mis-nomination has been admitted into the scientific investigations of this subject, for want of seeing the foundation principles of the thing. That which we have nominated the science of chemistry and vitality, and chemico-vitality—these terms are simply inventions of fools, to enable us to appear learned, when we are as blank as midnight. We need to have a correct and intelligible nomination of the modes of motion, or the

conversion of the one generic vital power into its specific modes or correlations of force, so that we may apprehend with some certainty the steps we are taking in trying to ascertain what physiology is—that harmonious activity of all the organs, each perceiving its legitimate function, so as to constitute the rhythm of human life, of soul and body, in a consentaneous effort to fulfill the intent of its production.

To deny that the conditions of sleep and anæsthesia operate so as to disintegrate the blood corpuscles, is to manifest ignorance, but it is a matter too fine to come within the range of the coarse means of our perception. *Anæsthesia is death* in the ratio of its manifestation, every time. And now what is the difference between chemical affinity and privity of oxygen, as being the so-called cause? Oxygenation being really the organic activity whereby our tissues are differentiated, brings us to the point where we are able to say that if we have not the exact equivalency of oxygen present to produce any of the tissues, or protoplasm out of which the tissues are fed, we will fail to get the full measure of health. The final analysis of organic structure discovers nothing but blood and nerve matter. That which when vivified becomes a human being, is at first nothing but a neural mass, literally all nerve. It is through that refinement of relation, that satisfaction of the affinities of the atoms constituting this protoplasmic mass that we get fulness of endowment. Deprive this mass of the necessary amount of oxygen to enable it to differentiate all the organs of the body and you will fail of proper development. And so, in a sense, we may say that oxygenation, in the due equipoise of affinities resident in the protoplasm, does constitute perfect health, and anything short of that constitutes disease in the ratio of its presence.

This affinity that has been spoken of in regard to the double decomposition between nitrous oxyd and the elements of the human body is a mere assumption, and the idea of this being a supporter of combustion is another assumption, because it never does that until the bond of affinity between nitrogen and oxygen is broken, and the oxygen set free.

And now is anæsthesia sleep? It is a kind of sleep, but we do make a distinction between the two, and, also, as has been wisely

said, between sleep and death. And what is the difference between sleep and death? One is a depolarization forever and completely, and the other is a depolarization only in a partial measure and for a limited period. Do we sleep all over at the same time? No. If we did we should die. How does the heart get along and live without rest? Does it sleep? Does it have a period of rest?

Dr. McQuillen: The learned gentlemen ought to be aware of the fact that the blood corpuscles were formerly regarded as vesicles with fluid contents, but that they are now recognized by histologists as solid substances.

On being subjected to the action of ether, chloroform and alcohol by Sansom, they were disintegrated entirely, and finding that they were thus broken up, he therefore inferred that the same result would follow from the inhalation of ether and chloroform. My experiments upon men and animals, however, demonstrated that no such disintegration of the corpuscles ensued. This would seem to disprove the theory entertained by Sansom, that the blood-corpuscles being broken up could no longer carry oxygen to the nerve mass, and hence that anæsthesia would necessarily ensue from privity of oxygen. He believed it acted directly on the nerve mass as a poison. It would no doubt be consoling to the friends of the inebriate when they found him reeling through the streets to say, he was not drunk, but was only suffering from privity of oxygen. We are asked by Dr. Atkinson, "Does the heart sleep?" Yes, it does, and the lungs too. There is a period of repose, recognized by physiologists so far as the heart's action is concerned. This action is divisible into three intervals: 1st, the period during which there is a long, dull sound; 2nd, a short, quick sound; and 3d, a period of repose.

It is a difficult thing to define what sleep is. When we come to analysis; to a clear, sharp-cut definition, language fails us. So far as all the phenomena of nature are concerned we can only describe the phenomena we see. As to the producing causes, they are too subtle for our finite minds.

Dr. Atkinson: The gentlemen has admitted the truth of my remarks by the very illustration he uses of the condition of intoxication. That is only shifting the idea by a little witticism. It don't touch the matter seriously. What is alcohol? It conists of hydro-

gen and oxygen, the oxygen being in such small proportions as not to satisfy the demand in the system, and that deficiency is what causes drunkenness. It *is* the privity of oxygen, nothing else. Again very mueh of the nitrous oxyd in use is not nitrous oxyd at all. Now if in this there is a small proportion of any mixture not properly prepared chemically, then whatever amount of the nitrous oxyd is inhaled, that, coming in contact with a blood corpuscle does satisfy the affinity for oxygen.

DR. MAGILL: I hoped the gentleman in carrying out the idea of his paper would proceed to some practical conclusions with reference to our profession. The tendency of the practice of our profession is to induce insomnia. Is this the result of nervous exhaustion or of mental excitement? I assume for the present that it is mental excitement, owing to the character of our operations and the intensity with which we are obliged to exert the brain for the purpose of arriving at certain results. I think we are all conscious of an exhaustion consequent upon the character of our work. Dr. Allen seemed to touch the subject practically. I think that if, as he assumed, insomnia is the result of over excitement—over stimulation of the brain, we should seek our remedy in a relief from such excitement; and I think one of the positions taken in the paper as to the question of sleep, whether it is produced by a determination of blood to the brain, or the absence or withdrawal of the blood from the brain, is a subject which it would be well to examine. I have noticed that Professor Buckland assumes that it is the withdrawal of blood from the brain. He cites the case of his father, who always after exciting brain labor, when he desired to procure sleep, ate a cracker, or perhaps a little piece of cheese, and retired to refreshing sleep. It is a simple remedy, and when we suffer from sleeplessness it would be well to supply the stomach with a little food, thereby withdrawing, for the time, the blood from the brain, and see if we do not get this result. I do not think as a profession we suffer from any one cause more than from this extreme excitement.

DR. FLAGG: I am entirely in consonance with Dr. Magill. Unless we can get something practical from these papers they are really as well unwritten. Sleep is a very extended subject to battle with. I have done a great deal of it in my time, and yet I feel totally incompetent to cope with the subject. It seems to me that our friend,

Dr. Atkinson, has struck the right chord. As much of his remarks as I could understand impressed me as being great good sense. If, therefore, what I could understand struck me so, I naturally infer that what I could not understand is greater good sense. Sleep is the desire for further life; the desire on the part of the animal economy to maintain life. In proportion as sleep is deep, strong and solid, just in that proportion is the recuperation. In proportion as it is short, slight and disturbed, in so far is it impossible to effect complete recuperation. If, then, sleep is such a restorative, it becomes a duty on our part as practitioners, in proportion as we become exhausted physically, mentally, and I might almost say morally, to go to bed early and not rise too early. Although I am no opponent of the progress of dentistry, yet I would earnestly urge my fellow practitioners not to get up at day-break and work with might and main at the chair all day, go to the laboratory in the evening and continue labor by lamp light, and then at midnight read up. I do not think dentistry will prosper so. My plan is to work at the chair a reasonable length of time, charge as unreasonably for it as I can, eat the best I can, and as much as I can, retire early and sleep long in a comfortable bed, and in a well ventilated room. I began this thing eight years ago, when I was flat on my back, weighing 122 pounds. Now, thank God, I am not perfectly flat on my back, and I tip 162 pounds. I will add to this my Saturdays. I see no one from Friday afternoon until the following Monday morning; and in doing this I feel that I am doubly biblical, for in the bible I am only ordered to rest one day in seven.

I think that sleep and anæsthesia are two different and distinct things. Sleep is life and anæsthesia is DEATH. Sleep is recuperative. I think anæsthesia in its proportion is DEATH, and that is a point I would like to make a practical one. I would stop this wholesale use of anæsthetics in the belief that they are harmless because they do not produce every time complete death.

Every time a practitioner places a patient under the influence of anæsthetics he places him in a dangerous position, if not to life, at least to health. He sows the insidious seeds of disease; sometimes only to the extent of a little unconsciousness, now and then; sometimes a perceptible and frequent inconvenience, and sometimes downright mania, or he produces chorea. I call to mind many in-

stances where patients have told me they never had a single indication of nervous trouble until they took ether; and that I consider the safest of all. From that time they had an uneasy sensation; at first an indisposition for food, then a certain stricture about the head, then an indisposition to reading, then a twitching of some one of the voluntary muscles, then a barking, then a clenching of the teeth, a condition worse than death. In this direction I speak as one in authority, having administered anæsthetic agents from three to five days a week for almost twenty years, and every time I do it I do so with a wholesome fear and trembling, lest with all my care a mischievous result may ensue.

PROF. TAFT: I wish I could emphasize and make still more forcible the words of Dr. Flagg, for I concur with him entirely. It is a most serious subject. There is a large number of dental practitioners who are in the daily habit of administering anæsthetics, the greater part perhaps, employing nitrous oxyd, a less number using chlorform or ether. Now if the result which Dr. Flagg speaks of is liable to happen to the patient from a single inhalation or an occasional one, how is it with him who is constantly inhaling these agents in their administration by his hands a dozen times a day for a series of years?

I have known many instances where operators have been injured in this way; and in many instances of failing health in our profession, though other causes may doubtless contribute, this undoubtedly is a very frequent and a chief cause.

Another point in connection with the remarks of Dr. Magill, and that is in reference to the exhausting nature of our professional labors. That is not wholly due to prolonged effort, or to the peculiar character of that effort; but a large measure of that exhaustion is dependent upon the incompatibility existing between operator and patient. Now I think every successful operator will appreciate this. Many times an operation of an hour or two, for one individual, exhausts more than a whole day's labor over another. With some patients there is a constant drain, while with others there is an absolute increase of energy.

This is a consideration which I think should influence operators in their labor. For myself, I have for some years refused to operate for some patients, solely upon that ground.

DR. REHWINKEL: I can bear witness to the truth of the statement of Dr. Taft, in regard to temperamental influences in producing depression upon the operator. I can also confirm, from personal experience, the remarks of Dr. Flagg, in regard to anæsthesia. Some twenty-five years ago, when I *served a term in the penitentiary*, I had learned to look upon chloroform as just as harmless as water. It was in 1848, just after its introduction. In these institutions the government gave instructions to test chloroform thoroughly. The instructions implied, if they did not expressly say so, that no responsibility would be attached to the administrator in any case. The object was to test this agent thoroughly, and therefore there was not the slightest operation performed without putting the patient under its influence. For six months during the winter of 1848 and 1849, I don't believe there was an operation at which I was not present. With such a familiarity with anæsthetics when I entered the practice of dentistry, I was not afraid of them more than of water. I used them during the early years of my practice freely, and two or three times I came near expediting a patient into the Happy Land of Canaan thereby.

As my dental experience grew, I became more cautious, and today I am not only cautious in their use, but I am afraid of them. In surgical cases, cases of great difficulty and involving much pain, their use is of course warranted. But in ordinary cases I have not given chloroform for ten years.

The instance occurs to me, reported by a gentleman of high authority and good standing, of a person of fine education and poetical tendencies, who accidentally read a poetical description of the charming effects of ether in stimulating a beautiful imagery. It struck him as the thing he wanted. He accordingly procured a quantity of ether, retired to his room, and put himself under its influence, His expectations were realized. His dreams were most pleasant. He saw the most delightful landscapes, and imagined the most delightful thoughts. He was desirious afterwards of repeating the sensation. He tried, but only partially succeeded, but he kept it up, and became a confirmed ether toper; gradually sinking in his condition; spending all his means to procure it. He finally got so low that he applied for admission to the charity hospital. Doubts were there entertained of the truth of his statement of

the enormous quantity it required to induce insensibility, and the most careful, thorough experiments were made to ascertain his condition. These experiments demonstrated that it took six and three-fourth ounces to put him only partially under its influence.

DR. TAFT: The discussion on this paper has turned upon the subject of health and disease in the practice of dentistry. I consider this subject of so much importance that it is at any time worthy of consideration at our hands; and any one will deem it so who reflects for a moment upon the fact that so large a number of our profession suffer in health from the direct influence of their work.

A few years ago there were scarcely any dentists in full practice who enjoyed good health. The last ten or twelve years, however, has witnessed a marked change in this respect. The occupation of the dentist is in many respects antagonistic to a good state of health. The confinement to which he is subjected is injurious; the positions of the body which it is necessary to assume, tend to injure the health. The work of the dentist, notwithstanding the common idea to the contrary, is of a very laborious character. In the first place it is physically laborious, but it is not so much the amount of strength he exerts as it is the strain required to hold a steady hand, to manipulate precisely and delicately, and to bring the operative or the executive powers to bear properly on living tissue. It is the nerve required to control and put forth a steady, persistent effort. This effort is not exerted by paroxysms, but it is a prolonged effort, running through hours, sometimes through the whole day. The surgeon, after the performance of a difficult and intricate operation, though it be of short duration, sometimes feels entirely exhausted, because of the intense concentration of faculties involved in order to perform so delicate and precise manipulation. Every one who has been engaged in the practice of dentistry understands very readily what is involved in all this. It is no wonder that the operator breaks down under the severity of the tension. When both physical and mental effort is put forth for a long time and in such measure, it is no wonder that health gives way.

Now we ought fully to recognize this, and so to regulate matters that this may be compensated for. The attention should be diverted from the objects of business as much as possible. The dentist should have something else upon which to put his attention; something

that shall promote both mental and physical recreation. His leisure moments should be spent in situations and under circumstances as different as possible from those which pertain to his every-day work. He should see to it especially that he has fresh air. And the matter to which I referred before, this matter of incompatibility between patient and operator, should not be disregarded.

DR. MORGAN: It will be remembered by some present that this subject attracted some attention in the Mississippi Valley Association years ago. Myself and another gentlemen who were present, offered an award of $200 for the best essay upon the subject of the peculiar diseases to which dentists are liable in following their profession, and the best remedy therefor. I apprehend that the diseases to which they are most liable are diseases of the chest, renal diseases, and hemorrhoids; and I apprehend that this is largely due to the constrained position they occupy.

The standing position enforces a severe strain, and I am glad to learn that many dentists have adopted the plan of sitting down. They thus avoid, to a great extent, that constant strain upon the muscles of the chest and shoulders which tends to press down the abdominal viscera, and bring about the troubles referred to. Some of the greatest troubles arise from the twisted position we assume in operating in a standing position, compressing the body in the region of the diaphragm, and producing an unnatural pressure upon the viscera of the abdomen.

In illustration of the idea advanced by Prof. Taft, that it is not the sledge-hammer blows which are so exhaustive, I might cite the fact that a man exercising with dumb bells, can sometimes raise with ease forty pounds, but if compelled to hold up one-fourth that weight for a length of time, he is completely exhausted. It is the persistent strain which causes exhaustion, and in the practice of dentistry we have that constant strain, mentally and physically, to an extent not equalled in any other profession with which I am acquainted.

I think in the arrangement of our offices too little attention is given to the matter of ventilation. Light, of course we are compelled to have, but if we could have more of the broad sunshine upon us than we do it would be still better. But in respect to air, great pains should be taken to secure the constant movement of a fresh current through our offices.

After I had been in practice several years I married and settled in the country, four miles from the city. I had a snug little farm and kept cattle and pigs and horses, and cultivated a garden. I left my office at four, five or six o'clock p. m., as circumstances permitted, and went home and occupied my time with the little concerns of my farm. After a lapse of two years circumstances drove me to the city to reside. In two years from the time of such change my friends regarded me as a broken-down man. I took the alarm, and procured myself a horse and buggy, and now when six o'clock comes, in the summer time, my horse is at the door, and the time until eight or nine I spend in exercise.

DR. BARRETT: The question respecting those patients with whom we cannot establish harmonious relations, is indeed one of much importance to the dentist.

We all know there is a great difference in patients. Some drain our nervous force, our vitality, as much in fifteen minutes, as others do in two hours. That, it seems to me, is one of the great causes why we are broken down as a class. We labor over those patients all day with whom we can establish no friendly nervous relations, and at night retire to our restless beds and toss uneasily through the night, awaking unrefreshed. What shall be done? I have patients whom I dread to have come into the office, so depressing are they. I have others over whom I can labor all day and yet feel comparatively vigorous and unwearied. There is no way of accounting for this fact upon known principles of cause and effect, and yet it is so. No more are we capable of discerning the distinction between life and death; between the living man and the dead subject. What is this mysterious thing we call life? We may give it a name, and add terms to our nomenclature concerning it, and after all we are no wiser; and we have at last to go back to the Divine word, where we approach, through its sublime simplicity, the nearest to an understanding of it: "And God breathed into man's nostrils the breath of life, and he became a living soul." It is a subtle question, and yet I think the time may yet come when we shall have discovered the laws governing the expenditure of vital force. Till we have done so we must go on and be robbed of it.

DR. TAFT: First impressions are sometimes unreliable, and a feeling of repulsion towards a person is not always to be trusted as indicating the nervous incompatibility of which I speak, but such is generally the case with me, and I trust it so far as frequently to make it a ground for a refusal to operate.

It has been said that our profession as a class are subject to insomnia. It has been my practice, if one night of unrest occurs to me, to institute a rigid inquiry for the occasion of it, and, generally finding it, I endeavor to avoid it in the future.

This general question of dental hygiene is an important one, and one to which I hope due consideration will be given.

Dr. McQUILLEN: I think this incompatibility is to a great extent due to the fact that the operator is not really in control of his case, his patient and himself. Learn to control yourself and your patient. It is said, that "he who conquers himself has conquered many cities." The case of Rarey, the horse-tamer, might be cited in illustration. His perfect self-control and coolness gave him the control almost at once over the most intractable animal. I hold that in like manner it is our duty as dentists to so control ourselves that we can control our patients. And this is effected not by being harsh and disagreeable, but through the exercise of personal magnetic power.

In relation to the theory of anæsthetics acting directly on the nervous mass: If privity of oxygen is the cause of anæsthesia, then sleep is caused in the same way by privity of oxygen. How are we to account for the prompt manner in which an anæsthetic acts on the nervous mass? How is it that nitrous oxyd in the course of a few seconds will produce complete insensibility? When we compress the carotid arteries, in the course of a few seconds insensibility ensues. Is it due to the privity of oxygen? A man accustomed to diving will remain under water at least three minutes, without trouble, and during that time he is not taking any fresh air into the lungs, and yet oxygenation goes on without interruption. In the respiratory effort all the air in the lungs is not expelled; we have what is known as breathing air—a certain amount thrown out and a certain amount taken in, but in a more forcible effort, what is known as complemental air is thrown off. By a still more forcible

effort what is known as reserve air is expelled, and even then there will remain the residual air, which the most powerful efforts will not remove, even when the lungs are removed from the body. The hydrostatic test for infanticide is founded upon this principle. If this be true, are we to say that anæsthesia is due to privity of oxygen? I admit that cutting off the supply of oxygen does interfere with the oxygenation of the nervous mass—does have something to do with it; but it seems to me reasonable to conclude that these agents act directly upon the nervous mass in producing the state of insensibility.

In regard to insomnia, that peculiar condition of the nervous system inducing sleeplessness, I will say that some years ago, when engaged in duties of a varied character as a practitioner, editor and teacher, I was obliged to rise early and work late in order to do justice to my several departments. In doing this I had recourse to such stimulants as coffee, etc., to keep the brain active in hours which should have been devoted to sleep.

This succeeded for a time, but it induced that nervous condition in which sleep will not come when it is desired. I could not sleep when I wished to do so. This condition is best remedied by exercise in the open air. The distribution of the blood to the various parts of the body thus induced relieves the congested condition of the brain. And here comes in an argument to the point that cerebral anemia, if not the cause of sleep is certainly a condition of sleep. We have that surcharged condition of the blood vessels of the brain. In respect to the matter of eating at night, there is a general impression that eating a hearty meal and then going to sleep at once is apt to induce apoplexy, night-mare, etc. It is true if one eats too much food, especially of an improper kind, and retires at once to bed, that the pressure upon the semi-lunar ganglion, or lesser brain, will induce such results occasionally; but I think that food of proper quality may be taken in moderate quantities without harm before retiring. In regard to the treatment of insomnia, much importance as a remedy is attached by Hammond to bromide of potassium. He says the use of this agent in doses of from 10 to 30 grains has, in his hands, produced remarkable results in relieving the congested condition of the brain, and soothing the nervous mass. We

have, however, the testimony of many good physicians to the effect that this agent is not so valuable for this purpose. I am not partial to the use of drugs. I believe with Holmes that if all the drugs in the world were in the bottom of the sea it would be all the worse for the fishes and all the better for man. If we can relieve insomnia by hygienic means it is best to employ them, and yet there are cases where hygiene fails. In such cases I believe that an occasional glass of lager beer serves a good purpose; at least I have found it efficacious.

DR. JNO. ALLEN: I am glad to see that this subject is being taken up for consideration. I think it ought to have been done long since. The object in bringing it up in this manner was to excite a spirit of inquiry in our profession as to the cause of our being so broken down as a profession. I find in conversing with medical men, lawyers, etc., that the proportion of deaths in a state of insanity is far less in their several callings than in our specialty. There must be a cause for it. It seems to me, as I remarked in my paper, that the nearer we keep to nature's laws the better. Those laws are things which we can neither amend or annul. The Divine Creator has provided certain materials for the nourishment of our bodies, and has established fixed laws, physical and chemical, for their government. Our only way to the firm ground of health is through a study and observance of these laws. Stimulants will afford no satisfactory relief. Just so far as we elevate the system above its normal level by the use of artificial stimulants, just so far will it fall beneath that level in their absence. And again, the longer one persists in their use the more it will require to bring him up to the standard, because every time he falls lower and lower below the proper natural standard.

DR. SHEPARD: I have been considerably interested in this discussion, and I would not say anything to diminish the interest in the inquiry with regard to what contributes to healthfulness in our profession. But I must say it has not been my experience to observe the tendency which has been spoken of as anything peculiar to our calling, at least to any such extent as has been inferred. We have still in our profession many old men in active practice. We have in Boston one gentleman who this week will be 75 years of

age, and who is engaged in daily, active practice. We have other men who have either just retired or are just about retiring, having secured a competency. There are several gentlemen in the neighborhood of 70 years of age in the active practice of dentistry in Boston. I will admit that they perhaps do not do as good work as the younger members of the profession. It is impossible, when a man attains that age, for his joints to be as flexible, his fingers as nimble and his back as limber as when more youthful.

As to insanity, there have been in Boston multitudes of men engaged in mercantile pursuits taken to the insane asylum on account of business perplexities, but in dentistry I do not recall an instance of insanity, although I have known many who died from paralysis and kindred nervous affections.

I think the large proportion of dentists enjoy a fair measure of health. The only reason why we see so large a proportion of young men in the profession is because twenty or thirty years ago our numbers were small. I question very much if dentistry is so destructive to the vital forces as has been stated. Over work in any calling produces its legitimate result, in dentistry no more than in anything else; and among those who have broken down within my observation, the large majority have done so manifestly from this one cause. One of our lamented fellow-laborers, who died a year ago, (Dr. Hitchcock), died simply from over work, laboring sometimes until three o'clock in the morning, studying microscopy and histology, and at the same time carrying on the duties of a large practice. The very day before he was stricken down by the disease which ended his life, he was at work until two o'clock at night upon an article for this Association, and with the fatal chill even then creeping over him.

The great secret of maintaining health is to enjoy our practice, to go to work with a zest, and yet not to overwork. Few appreciate how much a cheerful spirit of interest in our work conduces to health, and prevents the exhaustive drain which has been referred to. Incompatibility between patient and operator I grant does enter into the matter, but not to that extent which some believe, and the best counteracting influence to such depression is the cheerfulness and zest I have spoken of in the carrying on of our business.

DR. BARRETT: For my part I cannot avoid the conclusion that there is a greater drain on the vital force of the dentist than the practitioner of almost any other art or profession. The physician is not brought into such close contact with his patient as is the dentist. The lawyer pleading his cause of course exercises his brain severely, but there is not that nervous drain which the practice of dentistry involves. It is not the refractory patients that give us the trouble, but those who place themselves in our chair and settle down in a flaccid and passive state. Those are the ones who sap our energies.

DR. FLAGG: I rise in sympathy with Dr. Barrett. These passive, nonchalant patients most certainly do exercise an exhausting influence upon us, and it is certainly close contact which aggravates the trouble. I have sensibly diminished the bad influence by placing four or five thicknesses of cloth between myself and the patient. It is the touch of skin against skin, precisely upon the principle of the magnetic current, which causes it. Therefore, I do disagree with my friend, Dr. Shepard, and I believe that we belong to a calling which is exceedingly exhaustive.

He instanced several practitioners of venerable ages. I well remember my friend Gilliams, deceased now, who, when over 75 years of age, met me in Philadelphia and shook me heartily by the hand, saying: "Is that a good grip?" It was a good, vigorous grip, and he was a good practitioner, but then he was an easy going man, and they are the ones who last. Our vigorous workers, those who contribute to the resources of our art, and promote our science, are broken early, with, perhaps, some notable exceptions. This position I took years ago in a paper which I read before this Association: that the practice of dentistry calls upon its followers for a greater amount of power in every direction than any other occupation known to man. And that position I think I sustained. It is impossible for men to choose always the most congenial occupations, and no doubt there are many men in our profession who through unfitness fail of health as well as of operative success.

As to drugs, it is not the use so much as the abuse which makes them evils. And here I want to enter a protest against Hammond's advocacy of the bromide of potassium. My experience in its use may not, perhaps, be equal to his. It is at least sufficient to warrant

me in warning persons against its use. It is liable to leave a patient in a deplorable condition, and it is to be used always with the utmost caution, and in small doses. In the cases spoken of, as the result of many years experience, I should be inclined to choose in preference to any other the good, old-fashioned remedy of assafœtida. In cases of exhaustion from overlabor I do not know of any drug which is superior to this.

In regard to the question of sleep and anæsthesia, I recognize, with my friend, Dr. Atkinson, that we cannot see all the subtle workings which go on in the animal economy, but I think we should carefully distinguish sleep from unconsciousness. There is a great difference, and I am going to try to make the point that sleep is a recuperative action, while unconsciousness is an entirely different thing. We have heard arguments advanced to the effect that in sleep we have turgesence of the blood vessels, and assertions have also been made to the contrary. For my part I believe that in sleep proper, we have not that condition. Pure sleep is usually characterized by a slight paleness of the skin. Unconsciousness is generally marked by flush and fever. Nor do I think that in pure sleep it is a sleep of the molecules here and there, of one part and then another.

Unconsciousness, unlike sleep, is marked by turgescence of the blood vessels of the brain, and in the unconsciousness produced by disease there is a condition analagous to that termed anæsthesia. Pure sleep is always refreshing, but in anæsthesia the person awakes unrefreshed. It is abnormal in its effects. A young gentleman was once sent to me who was afflicted with a dog-like snapping of the jaws in chorea. Upon questioning him as to how long he had been in that condition, he replied that it had been years gradually coming upon him, and further inquiry traced the trouble to the administration of ether years before. It was only a stone added to the monument, as high as Bunker Hill, of the evils so wrought. And yet I regard anæsthesia as a boon to humanity, and one of the most valuable contributions to medical science. The difficulty is in the want of knowledge as to its proper administration. We have recently been visited in this country with a very destructive insect known as the potato bug. It has been suggested, for the purpose

of destroying it, to use a little arsenic mixed with a good deal of plaster. They tell us there is so little that it can do no harm; but put a bug into the arsenic; does he eat it? Not he. The poison is absorbed by the leaves and the destruction of the bug is caused by his eating them. And it is precisely because a small quantity is used that it is dangerous. Would you put a minimum of arsenic on a cancerous tissue, or would you not rather make a strong paste? The more arsenic you use the safer. And it is exactly so in the administration of anæsthetics. What is the condition of the patient when he is a little bit insensible? Every sentient nerve is raised to its utmost degree of sensibility; every sense of feeling is exquisitely refined, and patients frequently say that in that condition they experience the utmost torture in being operated upon. I believe in the administration of ether in overwhelming and extinguishing the consciousness. You will find in giving ether that the first sense to be affected is the sense of smell, and the anterior portion of the brain is the first to succumb. And in the administration of an anæsthetic the most critical stage is this partial condition of insensibility, just when the patient is being carried over the *pons variolii* to the induction of anæsthesia upon the medulla oblongata. When we affect these special nerves until complete insensibility ensues we have instinctive winking, and when you have carried the patient safely over that bridge, though we still have the power of winking, it is not instinctive, and you have reached ground where you may safely operate.

Dr. Atkinson: It seems to me absurd for us to go on citing examples of our personal experience which explain nothing, but simply show how these beautiful presentments of physiological law affect our minds. We say a great many things which have no argument in them at all. There is a stern earnestness in nature. There is a deep truthfulness in these subjects which ought to engage our highest powers, rather than always fluttering in the breeze of expected applause at the beauty of our own well turned sentences and fanciful conceptions of the modes of motion and the agencies which act on the organism we call the human body.

All that has been said of nutrition has been referred to motion of the blood, but even the astute minds of our Philadelphia professors

are astray when they tell us that it is not oxygenation and de-oxygenation which is the real point of expression of the turnings of these currents which we call nutrient currents; in other words, that polarization and depolarization of the elements of the tissues is not immediately affected by the presence of oxygen. Besides the constant supply of oxygen to the system in respiration, this mass of protoplasm is charged with it, and that supplies tonicity to the parts. There is a store of oxygen still kept in reserve, and within the reach of the little agencies which order it to take its place. When this supply is exhausted the system is dead, and there is no means of its restoration. So long as this protoplasm which supplies the tissues is charged to the satisfaction of the bonds of affinity of the substances making up the tissues—so long as that is kept up to a certain degree of tension of its currents, it is capable of being depolarized by the presence of oxygen. And it is the reversal of these currents that constitutes the difference between nutrition and de-nutrition—between the building up and the breaking down of the system.

Dr. Taft: I want to make a correction of an impression which seems to be in the minds of some in respect to what I said on the subject of incompatibility between patient and operator. I did not mean that state of irritability sometimes manifested by a patient towards the operator, but I meant something deeper than that, something more hidden. You will oftentimes find the condition to which I refer existing in a patient in whom there is no irritability; where they make no manifest opposition in any respect. Dr. Barrett struck the idea when he said that the most incompatible persons are those of sluggish, unresisting temperaments. There is something about them which is repulsive to the operator; a repulsion on one side or the other, possibly mutual, but rarely mutual, because a patient having a strong repugnance would not put himself or herself under such charge. But with the operator it is not so. Whatever kind of patient comes to him asking his services, he feels as though he must treat them. The irritable patient may be dominated and controlled, but the other condition is beyond our control. Do not entertain the idea that you can dominate such cases, for if you try to do so it will only increase the exhaustion attending them.

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REPORT

ON

Histology and Microscopy.

By W. H. JACKSON, of the Committee.

(Read by Prof. Taft.)

In making microscopical investigations of the structure of hypertrophied cement, I was struck by the frequency with which atrophy is found in connection with it. By this I do not mean the action that accompanies ulceration, which is simply a chemical action upon dead tissue. There seems to be constant changes in the intensity of each of the two opposing vital forces (absorption and resorption) at work in the system. Absorption takes up and appropriates whatever materials may be necessary for the perfection of the structure. Resorption removes all portions that have become old or useless. When the system is in a normal condition, the one balances the other, but let the one gain the ascendency from some abnormal condition and we have hypertrophy in all its forms, rapidly building up tissue beyond its normal size; but with the other we have as rapid tearing down of the tissue and the carrying of it off as excremental matter. I would call your attention to the frequent alternation of the ascendency of these forces; for through

these excessive and rapid changes are we able to prove that the osseous system may be constantly changing or renewing its tissues or that large portions of it may be removed and again built up, the same as in the soft tissues, though the change may not be quite as rapid. It may be said that the enamel does not change, yet no observing dentist will deny having filled teeth that were soft and tender, and years after found the same teeth hard and strong.

In examining hypertrophied cement we find it is frequently laminated, showing that there are times of great activity of absorption, followed by almost if not entire cessation of activity; also that there are places of greater intensity of action, causing the laminæ to be thicker in some places than in others. Often there may be observed a line, like the ripples upon water, running in the same direction as the laminæ, here and there dipping down into the lamina beneath, like the deeper trough of the larger wave among the ripples; this line shows to what extent resorption had taken place before absorption began again to carry on its work.

I have specimens in which the resorption penetrated the hypertrophied and true cement and far into the dentine, but absorption stepped in and the hypertrophy is greater than the original size of the root.

During these investigations many ideas came to mind for consideration, and I will give you the benefit of a few:

First: I noticed that in laminated hypertrophy the cement or bone corpuscles were most numerous at the beginning of each stage of activity of growth, having broad, flat bases, with filaments reaching toward the periphery of the laminæ; also, that they are larger and more numerous at the points of most rapid growth.

Queries: Why should this be the case? What function do these corpuscles fulfill? Are they analogous to bone corpuscles? Are the corpuscles necessary to the physiological structure of true cement? If they are necessary, why are they absent or wanting in the cement of some teeth? If not necessary, is their presence in true cement the result of a pathological condition of the cement organ at the time of the formation of the cement? May not these corpuscles be nothing but fragments or masses of periosteal tissue enveloped in the rapidly developed cement? I am inclined to

answer the last query in the affirmative, although I shall not take a positive stand until I make further investigation, as nearly all histologists are against it.

There is too little attention paid by the profession generally to the study of the minute structure of the teeth. A careful, thorough study of it would prevent many permanent injuries to the nerve, and many aches and pains arising therefrom. We should work with exceeding great caution in excavating cavities in the incisors, as very often quite large filaments of the pulp extend far into the dentine. I have specimens where these filaments extend through the dentine; one of an inferior incisor slightly worn on its cutting edge, but at three points the nerve was exposed, causing its death and the loss of the tooth. Several other teeth in the same person's mouth gave evidences of a like structure, and the nerves will probably become exposed in the same manner.

In examining the transverse grooves often found on teeth, I find they have two distinct characters. The first class, those which have rounded sides, are undoubtedly formed during the development of the teeth, and are caused either from pathological conditions of the primary dental organ, or from varying intensity of action of the dental organ during the formative process.

The second class, where the sides are hollowed out, uneven or ragged, are the results of chemical action of the secretions of the mouth at different stages of growth of the tooth after it has cut through the gums.

Thus it will be seen that there is a marked similarity between the first of these conditions and hypertrophy, both assuming rounded borders. Also a greater similarity between the second and the result of resorption, both being hollowed out.

Prof. Stricker, of Vienna, has been making some very interesting investigations on the pathology of suppuration, published in the December number of *Stricker's Medizenische Jahrbuch* for 1874; also a short notice of the same by D. J. Hamilton is found in the April number of the Quarterly Journal of Microscopical Science, 1875. He arrives at the following conclusion: That pus corpus-

cles are formed by fissiparous division of the cells of the injured or diseased tissue, and not collected from the circulation. Also, in the same number of the Microscopical Journal, are described the results of examinations by P. Kidd and Dr. Klein, of the ciliated epithelial cells from a frog's mouth. These observers noticed amœboid movements in certain cells, the nuclei of which seemed to move spontaneously.

ADDITIONAL REPORT

ON

Histology and Microscopy.

By EDGAR D. SWAIN, OF THE COMMITTEE.

(Read by Prof. Taft.)

Your committee upon microscopy and histology have to report but little new under this head during the two years past. In fact, the past year appears to have been one of decided barrenness in this direction, especially so when compared with the three or four preceding years, during which time there were added to our literature the publications of Wedl, Ball, C. S. Tomes, Salter and others, all containing more or less upon the histology of the dental tissues, and settling for years, perhaps, some of the questions which have troubled students in this direction for a considerable time.

During the last year articles have appeared from the pen of Dr. H. S. Chase, of St. Louis, in the *Missouri Dental Journal*, setting forth certain new theories regarding the histology of dentine, illustrated by cuts, showing certainly an unusual appearance of such structure.

Much unkind criticism has been made upon the theories of Dr. Chase, and incredulity expressed as to the correctness of his illustra-

tions. Your committee, not feeling disposed to condemn unheard any man, and feeling that all had not been discovered yet as to the matters advanced by Dr. Chase, determined to investigate the subject as fully as possible for themselves, and, if anything was discovered to justify it, to embody the results in this report. The investigations of your committee do, in their judgment, warrant a statement of the facts here, and a brief discussion of the theories suggested.

Your committee examined the specimens or preparations in company with Dr. Chase, of St. Louis, Prof. H. A. Johnson, of the Chicago Medical College, one of the best histologists of this country, and Prof. I. N. Danforth, of Rush Medical College, also a histologist of high repute.

The preparations unquestionably presented the appearances delineated in Dr. Chase's drawings, though not quite to the extent there shown. The bead-like appearances were well defined in the *tubuli* of quite a number of the specimens. These appearances were apparent to all the observers, and the number of specimens showing them, claimed by Dr. Chase to be from different teeth, was quite large.

Prof. Chase informs your committee that all the specimens showing this baccated appearance of *tubuli* were from teeth extracted from persons not over seventeen years of age, and before full and complete development had taken place. He advances the theory that the dentinal cells have placed themselves in linear arrangement, and that the proximal ends have united, the cell wall at the point of union being absorbed, and by a continuation of this process dental *tubuli* are formed. Further, he advances the theory that the nuclei of the cells still remain in the calcified cell walls, and that they retain the vitality necessary for action whenever the proper conditions exist; and further, that it is through the renewed action of this cell power that the vital actions claimed by him in fully organized dentine do occur; for instance, as the absorption of dentine from beneath a perfect gold filling to such an extent as to unite the cavity of decay with the pulp cavity. In other words, Prof. Chase claims that "the two opposite processes of calcification and decalcification may and do take place in the perfected hard

tissues of teeth; and furthermore, that the basal structure itself, or the animal portion of dentine, may be removed without chemical action." (See page 108 Transactions Illinois State Dental Society, year 1873).

Now what Dr. Chase has seen is undoubtedly there, and the appearances are not due to any imperfection in mounting, nor to peculiar modes of preparing the sections. But these appearances alone do not establish the theory advanced by him. Analogical reasoning proves his established observations, and facts might justify his conclusions, but his theory cannot rest upon a sure foundation or be considered as established until he shall be able to fortify his position by demonstrating (by use of reagents) the presence of the nuclei within the calcified walls of the assumed cells.

Attention was called to the appearances observed and demonstrated by Prof. Chase, by John Tomes, in a course of lectures upon "Dental Physiology and Surgery," delivered at the Middlesex Hospital School of Medicine in 1846. The lectures were first published in the *Medical Gazette*, and were revised and published in book form in 1848.

I will quote from his lecture on the formation of dentine as much as is parallel to the theory of Prof. Chase. He says: "The component cells acquire a linear arrangement, those nearest the surface being the first to take this position. These so-formed columns are nearly vertical with the coronal surface of the pulp, and lie parallel to each other, holding the same relative position among themselves as do the dentinal tubes; each cell, after falling into line, divides into two or more in its length, and each division elongates. A central space or nucleus is seen in each cell, which lengthens with the cell. The cells, by their increased length, become placed end to end, and ultimately unite; the elongated central space of each individual, by further development, joins and opens into those of the superimposed cells, thus forming a central tube common to the lineally united cells. At about this period of development the earthy matter is received into the tubular and intertubular tissue, in other words, dentine."

Mr. Nasmyth considered what Tomes described at this time to be baccated fibers, and not tubes. Mr. Tomes explains that the bac-

cated appearance arises from the individual pulp cells, which have by their union, contributed to form the tube, preserving the convexity of their centers and at the same time preserving a constriction at the point of junction. So the baccated appearance may be regarded as an arrest of development.

Again he says, on page 75, regarding the disposition of the nuclei: "It would seem, when tubular tissue is required, the tubes are formed by a linear confluence of cells. The *nuclei* and opposed surfaces disappear, thereby leaving a tube, the axis of which is the former axis of the cells."

It will therefore be observed that Profs. Chase and Tomes only differ materially as to the disposition of the nuclei of the cells, a question of the most serious importance. Should the theory of Prof. Chase, however, be correct, dentine becomes invested with new and important features.

Prof. Chase is engaged in a field of investigation never before so thoroughly traversed, so far as your committee are aware; and what he has seen certainly cannot but suggest theories somewhat in conflict with those generally adopted, and stimulate truly scientific men to the most thorough investigation of this subject. Dr. Chase is entitled to great credit for his untiring labors, which have thus far extended to the preparation of five hundred (500) specimens. He proposes to prepare five hundred more, from diseased teeth. Such investigations cannot fail to be of great value; and if he fails to reach the truth through them, he, at least, furnishes material from which it can be worked out by other minds.

A very interesting case of dentigerous cyst has recently come into the hands of your committee through the kindness of Dr. Goddard, of Louisville, Ky. The history of the case is something as follows: A lady, aged twenty-three years, called upon one Dr. D. M. Morse, of Richmond, Ky., for the purpose of having her teeth extracted preparatory to the insertion of artificial substitutes. The deciduous right cuspid was still in its place. After the extraction Dr. Morse observed an enlarged condition of the alveolus; supposing that either the permanent cuspid was in the jaw not erupted, or that the deciduous root had parted, he carried

his alveolar forceps well up, and outside the enlargement, and cut through; removing the same, his attention was arrested by the peculiar appearance of the mass in the blades of the forceps. Upon examination he was not a little surprised to find instead of a cuspid tooth, or the root of the deciduous tooth, that he had extracted *sixteen miniature cuspid teeth!* The floor of the cyst, upon examination, revealed the sockets of several of these small teeth.

The young lady informed Dr. Morse that the right permanent cuspid had been extracted several years previous by her physician, (with hammer and spike!) and that it came in as a tusk (so called). Several days later she exhibited the cuspid so removed, which Dr. Morse reports to be a right cuspid, and a perfect tooth.

Cysts of this character are by no means common, and are therefore fraught with considerable interest to the profession. A few cases are reported by Chas. S. Tomes in his latest work upon "Dental Surgery." One case only is reported by Wedl; and as neither these or other authors have given us the microscopical appearances of the teeth, your committee deemed it worth their while to devote a little time and attention in this direction. The results of the microscopical investigation by the committee are submitted to you in the photographs prepared for it by Dr. Oliver of Chicago.

The question arose in the minds of your committee whether these nodules, having the outward appearance of teeth, and all of one type, were really teeth; whether they possessed the histological peculiarities observable in tooth structure. We find them to be perfectly developed teeth as to enamel, dentine, cementum, and containing a pulp cavity.

Tomes gives no theory as to how such phenomena could be produced. Wedl informs us that Nelaton declared them to be multiple tooth formations in one alveolar socket. Broca, he says, modified the declaration so far as to say that they were not developed from so many tooth follicles, but originated in a division of the primary tooth germ. This appears to your committee the most reasonable explanation.

It is an undisputed fact that cells do sometimes assume an abnormal activity, as in cases of tumors, and multiply themselves to a wonderful extent. It is probable that the primary tooth germ by gemmation produced sixteen daughter-cells, and each of these

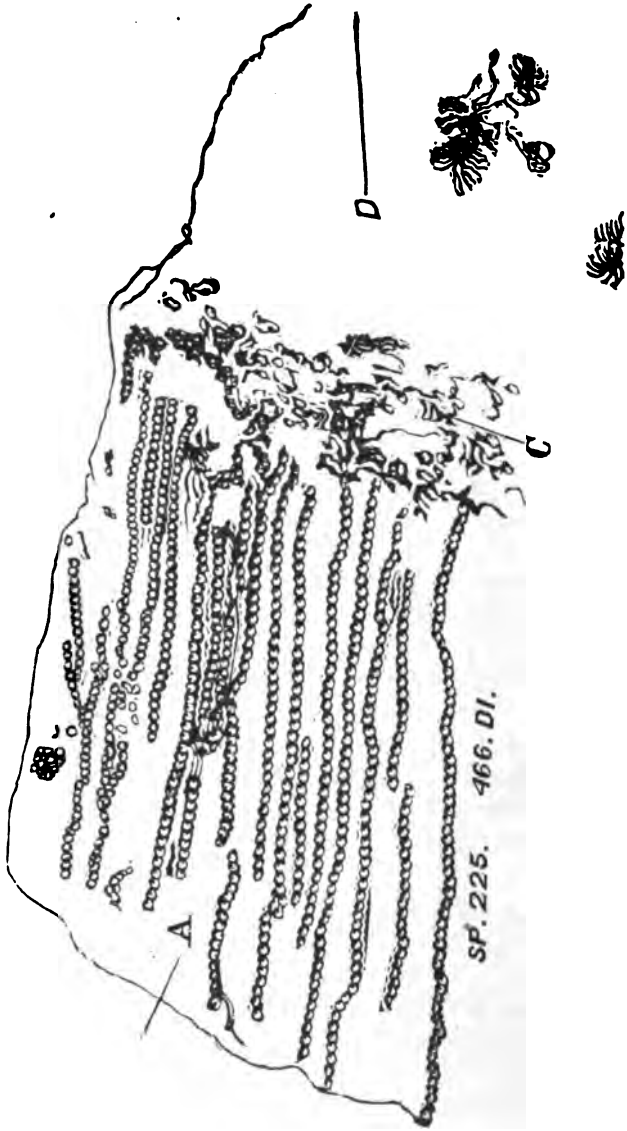
daughter-cells has given us a tooth in miniature. Thus we have the sixteen teeth all belonging to the same type. As the primary cell of a cuspidatus is able only to produce a cuspid tooth, following the physiological law governing the growth of cells, we came to the conclusion that the mother cuspid cell could only produce cuspid cells. Cell genesis always preserves the type of the mother cell.

It is asserted that three-fifths of all abnormal growths present no new type of cells; if it be a fatty tumor the cells are fat cells unmistakably. Equally true is this of all other abnormal growths depending upon cell development.

The inquiry arises, why have we not then sixteen full sized teeth? The only reply we can suggest is that the power of a new cell to develop tissue of any character depends upon the power or capacity to assimilate new material of the kind necessary to produce any tissue. This law may account for the miniature size of the teeth usually contained in cysts. The variation in size may perhaps be accounted for upon the ground that the larger teeth were the first daughter-cells developed, while the smaller ones were developed by younger cells borne by the mother cell when there was less activity, or when, perhaps, the mother cell had exhausted herself by the over amount of work already performed.

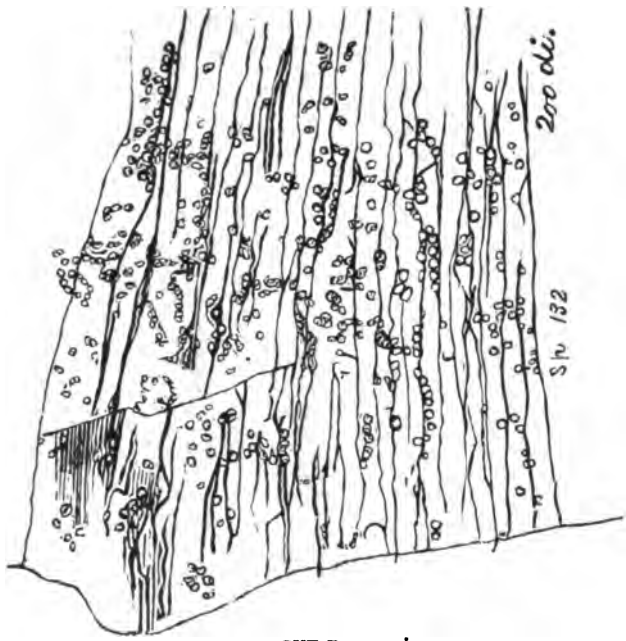
Your committee are aware that in thus speculating upon the physiological possibilities regarding the development of cysts they have stepped outside the matter assigned them. They, however, believe the subject invested with sufficient interest to warrant the step taken.

The subjoined cuts and photographic illustrations are submitted with the report. The wood cuts, A, B and C, are illustrative of the investigations made by Prof. Chase; the photographic illustrations, which were prepared by Dr. Oliver, of Chicago, refer to the dentigerous cyst described in the report. Explanations of each illustration will be found in connection therewith.



CUT A.

Field of dentine from root of permanent upper second molar; boy aged fourteen; end of roots not quite finished. Tooth not decayed. "A." This and other clear spaces are occupied by dentinal tubes, which are here omitted the better to show the cellular appearance of the dentine. The rows of cells seen in the cut can be resolved into a continuous dark line without the appearance of cells, by a different focus of the microscope. "C." The irregular cellular territory between cementum and dentine. "D." Field of cementum indicated only by a few cementum cells. Magnified 466 diameters.



CUT B.

Specimen No. 132. Cross section of root near end, from a decayed under bicuspid. 17 years old. Magnified 200 diameters.

CUT C.

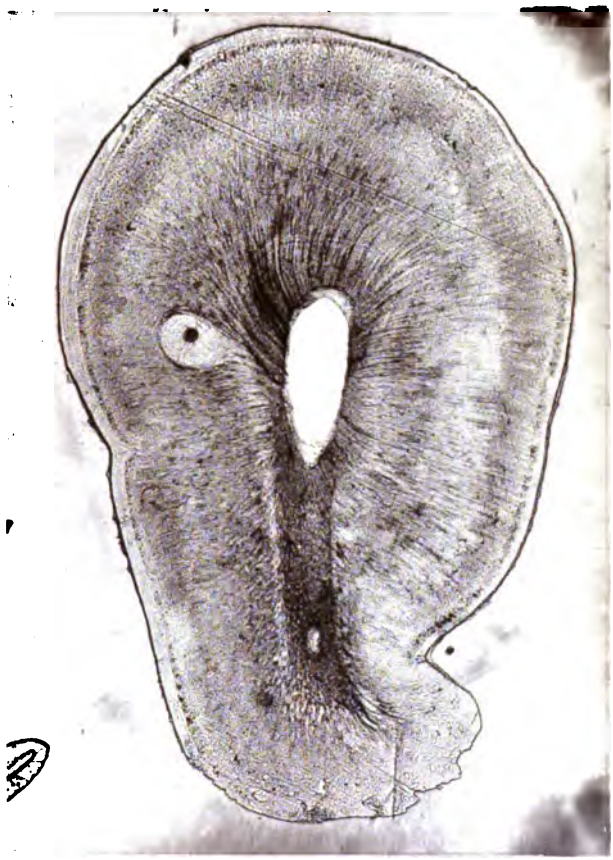
Specimen No. 6. Magnified 466 diameters. Longitudinal section of crown from under central incisor, 65 years old. Tartar on neck. Root canal closed for some distance by new formation. Extracted on account of pericementitis. Undecayed. Cellular appearance in dentine territory.

No. 1. One of the teeth of the dentigerous cyst described on p. 57, full size, magnified 200 diams. by a $\frac{1}{12}$ inch objective. The root of this tooth was not fully developed, though it will be observed that, so far as developed, it is a perfect tooth, anatomically and histologically.

No. 2. Full crown of a partially developed tooth, similar to No. 1, and showing a similar completeness of histological characteristics. 16 diams.

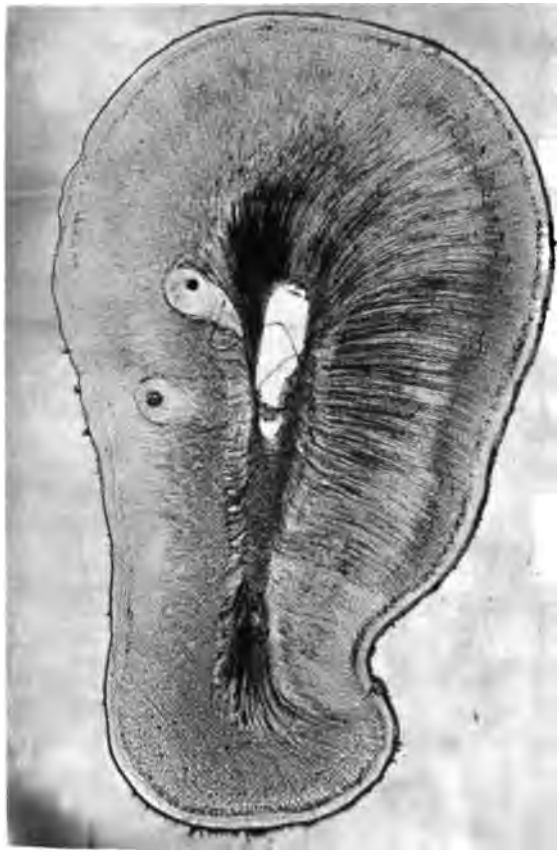
No. 3. Pulp chamber of specimen No. 2, showing formative cells, some of which are shown in this specimen as budding or dividing by the "dumb-bell" process. 40 diams.

No. 4. Part of the crown of another of these teeth, from one side of the pulp canal, and midway between the canal and the cementum, showing calcified remains of a capillary. 22 diams.



No. 5. Transverse section of No. 4, cutting across the capillary. 25 diams.

No. 6. Transverse section of capillary shown in Nos. 4 and 5, enlarged to 50 diams.



No. 7. Transverse section of tooth shown in Nos 4, 5 and 6, cut through the loop of capillary 40 diams.

No. 8. Section of No. 7, magnified 50 diams. showing transverse section of loop of capillary, and formative cells in pulp cavity.

No. 9. Section of same tooth shown in No. 7 and 8, but from the opposite side of pulp cavity. 20 diams.

These illustrations are from micro-photographic negatives prepared by Dr. O. C. Oliver, of Chicago, reproduced by the American Photo-Relief Co., Phila.

DISCUSSIONS.

DR. ATKINSON: I am very glad that this subject is brought before us, and I hope it will be thoroughly discussed. I only took a few notes on the last paper, and will speak with regard to this dentigerous sac that is called the product of a mother cell of a cuspid tooth, and assumes that that cell was divided up into a number of darling little daughters just like herself. Such a conception as that is not well grounded. If we know anything about the formation of teeth, we know there are teeth which are mere filaments, of a fibrous character, simply little corneous substances; and yet they are as legitimately teeth as the most complicated organizations we meet with in tooth structure. What is the law of development here? There may be filamentous teeth, or single denticles, or there may be many denticles together, so that you will have multicuspid teeth. All these have a type which resides in the original papilla, which becomes the pulp, or the pulp contained within the sac. That is the precursor and necessary foundation of the development of all teeth. And in the classification of teeth, why is it that we have cuspids, and incisors, and bicuspids, and molars, and tricuspid, and multicuspid teeth? They grow out of the alternation of generation of a certain series of cells, so called. And these cells, *per se*, by their very nature are endowed with the ability to classify, to lay down the line of development after the manner of crystallization in the mineral kingdom. They are formed in a bed of animal matrix, and this is characteristic of enamel cells. Those cells, if not calcified, could not be differentiated by five men in a hundred as enamel cells. We only judge of them after they have completed their work. But we can make a correct classification only by going back and examining these cells in their soft, plastic condition. The proof of this requires the observation of a number of specimens of enamel rods in the different stages or degrees of calcification. The end of the rod calcifies nearest the pulp; calcifies first by the deposition of

lime salts, converting the cell into the first section of the rod. This may be fully calcified; the next cell may be half calcified and half uncalcified; and the next cell holding lime salts in solution, but not yet granulated so as to indicate their presence. The next cell will be slightly modified from the cuboid form, and the balance of the cells that are the elements of the enamel rod will be younger and younger until we come to the peripheral end, which is represented by a cell like a collapsed epithelial. The whole enamel is but an accumulation of these, side by side. The pulp is composed of blood-vessels, nerves, connective tissue and protoplasm, and hence is an organ, not an element.

And now no man is entitled to classify teeth who has not seen their inception, their growth and multiplication, so that, the alternation of generation of cells being completed, we are enabled to clearly understand the series nature has ordained.

There is a whole series of cells. There are muscular cells, and connective tissue cells, and there are cells constituting the soft tissues; and in the tooth there are cells whose office it is simply to harden the other forms of cells. We have already delineated a series we call enamel cells, and we have another series called dentinal cells; and then we have a compromise between the enamel and the bone, denominated cement cells. These are all different stages of development, but they come into existence by one birth. When the pulp was soft the limitation of possibilities under the enabling circumstances was set, and by that alone we can classify those teeth.

Going back and improvising, and inquiring into the cause of this or that form, and nominating them all cuspid teeth, is utterly profitless. It is by the law of the feeding of these cells that we get any of these tissues, but it is not yet known what the limitation is as to enamel, dentine and cement.

Now, in relation to hypertrophy of cement, the paper says the remnant of a cell is—what? Connective tissue enclosed in lime; and they accounted for a cement corpuscle in that way; but we know that it is the uncalcified tract of the cement cell, just the same as the fibrilla is the uncalcified remnant of the series of cells that originally formed the tubule in the dentine. We are dealing with various classes of cells, but not in the order of mother, daughter and grand-daughter, because they are all of the

same birth, but grow to maturity with different degrees of rapidity, according to the enabling circumstances. In chemistry we have synthesis and analysis, or togetherness and apartness; that has hitherto been confined to the azoic or inorganic kingdom, and that is why they make a misuse of the term chemistry. There is a chemistry to every substance, however coarse or fine that body may be. Complete expression of togetherness comes under the dominion of crystallization. Crystallosophy is a compromise between that and the looseness of holding which gives us the vegetable kingdom, which is cellulation. And we have another stage of togetherness, which is denominated crystallosity, or soft-solid bodies, which is the basis of the animal kingdom; but you get no vegetable thing, or the substratum even of a disintegrated mineral upon which to base this form of being, and you get no complete or chaotified condition of the vegetable kingdom out of which to get your animal kingdom; but we find when the human body is completely solidified that it is remanded to the domain of crystallosity, or most dense togetherness, or closest synthesis. That is the mode of its nourishment. But when we come to the vegetable we find that it holds together only loosely so long as there is vibratory or breathing motion, assimilating that which is best for its development and throwing off that capable of being remanded to the law of crystallization. As we rise in the scale of being, we see that there are tissues kept in a changeable state in soft-solids, and when their elements are unfit to fulfill the duty of constituting the filaments of tissue, they are dissolved and remanded either to solution or deposition, that which is capable of making new protoplasm being taken up and appropriated to new uses in the system. Now, what is the nutrition of the teeth? The nutrition of the enamel is the nutrition of crystallosophy; the nutrition of the dentine is in the intertubular part or connective tissue; the nutrition of these intertubular substances or fibrils is vegetative, or by a to-and-fro current of circulation. That circulation, as long as it is supplied with lime, is continually adding matter to the tubules, so as at last to solidify the entire territory and remand it back to the mineral kingdom. Coming to the cement cells, we are still rising in the amplitude of the currents of nutrition, and in complication of the modes of motion.

When we get successive deposit, solution, and removal where a deposit was made, the first deposit is most calcified, and the last the least so, or with more of the canaliculi within them. The question was, what was the mode of nutrition? Was there any vitality in them, and could you reproduce it? It is doubtful whether you could reproduce any cement. You may have a dissolution and a re-deposit, but it would come by a calcification of a new cell belonging to the series that is beneath, and when all the germs of these cells shall have been exhausted, that is the limit of your calcification, and if you have a development after that, it is simply creation and not reproduction.

PROFESSOR MCQUILLEN: In listening to the reports which were made this morning, I was very much gratified to find that one of the gentlemen referred to in the report, Dr. Chase, had been engaged in the preparation of microscopical specimens, and in making microscopical observations. I was gratified to learn that fact, for I regret to say that, so far as our reports in this Association are concerned, there has been too much of a disposition on the part of gentlemen to avail themselves of the investigations of eminent histologists abroad, and I have been delighted on various occasions to observe how well informed many of the members of our Association have been on advanced histology, so far as the observations of Owen, Tomes, and others in England and Germany are concerned. We all recognize, however, that Americans have eyes and ears, and it seems to me that they could use them to just as much advantage as European microscopists. The microscope in this country as a rule, is too much of a toy. Gentlemen use it only for amusement. Therefore I am glad to learn of this movement.

In looking over the photographs offered in illustration, I find them to be as fair specimens as I have seen, but at the same time such photographs will never take the place of the microscope and the object under it. The reports should be (and during my connection with the committee I have endeavored to make them so), as far as possible the results of original investigations, backed up by the object under the microscope.

In one of the reports offered, I do not remember which, reference was made to the views of Tomes and Nasmyth in relation to the appearance presented under the microscope by dentine in relation to

its formation, and we were carried back to the discussions that occured in former years in relation to the question as to whether dentine consisted of baccated fibers or whether it was a combination of cells, by means of which we had what is known as the tubular and intertubular structure. Passing from the consideration of that, we come to the consideration of the foundation of dentine itself.

Dr. Atkinson very properly took exception to the view of a pulp being a cell, in place of it being, as it is, a combination of cells. He went on to describe the manner in which enamel is formed, and the manner in which dentine is formed. But here, to properly understand this question, it seems to me we must go deeper than that. We must go to the origin or beginning of the structure of life. Exceptions may be taken to this by those who do not recognize the distinction between animate and inanimate nature, but this is a view sustained by the best authorities.

The original formation of tissue, and the maintainance of that tissue in the process of what is known as nutrition, is not a subject for microscopical observation. We can observe such formations, but we cannot perceive the act of formation, or the process of nutrition. It is too subtle. We may theorize upon it, but that is all. In physiology I was, taught as a student, and as a teacher I have taught, that *omne vivim ex ovo*, from a living system all things rise. I received and honestly taught it, and believed it for years; but, gentlemen, I am now a skeptic in relation to it. In the institution with which I am connected I cannot teach this old principle as true. I am not prepared to say it is false, but I cannot regard it as beyond question a true one. We are informed by clear, philosophical observers, such as Bastian, that a formless, pure fluid, which has been subjected to an intense heat, and which has been so kept that no organic life could possibly get into it, that from such fluid life has been evolved *de novo*. In relation to the theory that it requires an existing germ out of which a substance is to be formed, there are those who insist even on the necessity of a germ-crystal in a fluid out of which crystals shall be formed. Most people laugh at such an idea, and yet such views as that have been advanced and supported by able arguments. But if it be true that it does not require a germ out of which a crystal shall be formed, it seems to me

reasonable to infer that out of a fluid containing apparently no organic elements, we may have life evolved *de novo*. In a living organism the possibility of the organization of anything like a substance *de novo* seems impossible. So far as the fluids circulating in vegetable and animal organisms are concerned, we find living fluid in contact with living substances. Under such circumstances it is the living dependent upon the living; but the existence of the vegetable is dependent upon its obtaining from inanimate matter by solution and by absorption, the inorganic substances out of which it is to be formed. And the same is to a certain extent true of the animal. It does not subsist upon living matter. We, as human beings, to a marked extent, animals not to the same extent, live upon what we denominate dead matter. We destroy the animal, we destroy the vegetable. We not only destroy it so far as its somatic life is concerned, but by cooking we destroy the molecular life. It is taken into our organism as dead matter. It is masticated, insalivated, undergoes the process of digestion, and eventually becomes part of our organism. Now when does it pass from the dead into the living substance? When does that carried into our organism as dead matter become vitalized? Is it when the assimilation takes place, or after that? Do not we here have a case of the evolution or development of life *de novo*? Be that as it may, these are subjects, it seems to me, which ought to be brought into connection with this matter of the development of tissues, and the process of nutrition.

In the reports read, and in the discussions we have had, it seems to me there has not been a full recognition of the present views entertained in relation to the formation of dentine. In former times, in speaking of dentine, Owen, I think it was, regarded the formation of dentine as a centripetal process of calcification of the pulp. We recognize at the present time that there is in that pulp a congeries of cells, arranged without apparent order. In process of time these cells become arranged in a lineal form. In addition to this it is now held that the cell itself undergoes a peculiar change, becoming an odontoblast, and these are arranged side by side, forming on the outer portion of the pulp a membrane known as the *membrana eboris*. And this is elongated side by side, having, in

addition to its peculiar elongation, prolongations projecting outward into the cell itself; not merely one, but possibly two or three. As these are side by side, calcification takes place between these odontoblasts, and this constitutes what has been denominated the intertubular structure, or the matrix which holds the tubules together. Inside of that again we have the inner portion of this cell, which has undergone a gelatinous calcification, forming the cell wall; the wall of the dentinal tubule, or sheath of Neuman, and inside of that a prolongation directed forward (ostoblasts) which retains its soft-solid character, and which is not converted into dentine by any deposition of the calcareous matter as the other portions have been. This constitutes what has been denominated by Tomes as the dentinal tubuli.

I offer this for what it is worth. I only regret, so far as I am concerned, that I have not here to offer, as I claim that a man should have, the results of original investigations. I trust the time will come when our dental institutions will be so situated that young men possessing the taste and ability shall have an opportunity of devoting themselves exclusively to original investigation. When that time comes then America may make its contributions to dental science as England and Germany are able to do at the present time.

Dr. Atkinson: I am sorry there are so few willing to take part in this discussion, but we should be thankful that we are able to begin to make the marks constituting the alphabet of our learning in this direction.

The last speaker gave us a theory of the beginning of life *de novo*. He must classify better than he does before we shall know what he means. It is true we shall never know anything about the origin of life until we shall have gone to the bottom; but does his theory have this final and ultimate basis?

Let us nominate a few things which may help us to an apprehension of what we mean by life. There is a substratum which is nominated atom. That is the lowest manifestation of material existence of which we know. And we know of no function that is not in immediate connection with some combination of atoms. Atoms themselves are already endowed with life. Atoms cannot

be killed. There is no such thing as atomic death. Then where is that inception of life which is spoken of? We have been told that our food is in a state of molecular death. What a conception! Molecular death, and yet capable of containing the elements of life! Let us see what it means. The affinities resident in the atoms, upon being brought within the sphere of influence, coalesce according to the bonds of affinity governing them, and form molecules. Those molecules are the plasma out of which all formations take their origin, and by which they are maintained during the period of their possible existence as aggregations of molecules. Something must die that something else may live. The mistake is that we do not recognize the differentiation of the manifestations we call life. I gave you a synopsis of that this morning.

We had crystallic life, but there is an aggregation of something below that again. I did not define what a crystal is. It is formed of regularly arranged granules, that are regularly arranged molecules, that are regularly arranged atoms. And if in the vegetable kingdom you have, in addition, cellular life, you have also a correlation of cells constituting tissual life, and an aggregation of tissue forming organs. Then we have systemic life, and the complete system holds the somatic life which dominates the entire organism. And in that somatic life in the animal dwells the conscious life, by which we apprehend these manifestations. When you have destroyed conscious life you have not destroyed atomic life, for when that has left the organism we have remaining all the affinities I have spoken of as somatic life. Food is life in a protoplasmic mass; molecules with the presence of all but that special kind of life. That is food. That is the chaos out of which we live.

"*Omne vivum ex ovo*:" "All living things come out of an egg." It depends upon what you consider an egg, as to the truth of that. If you say a protoplasmic mass is an egg, it is true, because you get nothing without the substratum of general principles which it becomes the differential expression of. But what does Bastian's investigation prove? It only proves that these points of origination of apparent manifestations of life are points so small as not to have been detected before, and in fluids which have been subjected to degrees of temperature which were before considered fatal to all

forms of germs. That is all it proves. It does not prove that these are not essentially eggs.

Dr. McQuillen said there were very few people such fools as to say there was a germinal point around which the particles of a crystal aggregated to form a crystal. I told you this morning what it was; merely a polarization and de-polarization of currents producing a crystal. It is nothing in the world but pure water. You know water being frozen is larger than it is in a fluid state, and there has been much discussion as to whether it is actually larger; whether there were not interstices between the crystals filled with air. That, however, is proved to be a fallacy. We do not know much about size anyway, and it is difficult to prove anything when we come to atoms. We can only surmise that an atom is about the two hundred millionth of an inch in size. Now, suppose a current of thermal action is passing two ways, that is to say, one side of a body of water is warm and the other side is cold. You see there will be a current going up and down. If it is in the case of water that is deep, that polarization and depolarization of the current brings you to a point where the currents are *nil.* At that point freezing begins, and the freezing is simply the arrangement of its molecules in crystals. It does not make cells in that case at all, and the first arrangement is the laying down of granules. It is only an aggregation of molecules of water—molecules of water being two equivalents of hydrogen and one of oxygen; in other words, one dyad of oxygen to two monads of hydrogen. Let the oxygen be represented as an individual with two poles, each one seizing an atom of hydrogen. When it does so seize it, the size is reduced, I don't know exactly how much, but very many times. As long as that form holds together we have water, but when the currents change the water from a fluid to a crystalline form, we have an example of polarization and depolarization.

REPORT OF THE COMMITTEE

ON

DENTAL CHEMISTRY.

By H. A. SMITH, Chairman.

In presenting a report on Dental Chemistry, I would first direct your attention to a subject which has been investigated with considerable care, during the past year, by Dr. S. B. Palmer, a member of this committee, viz: "Chemical and galvanic action upon teeth, and the materials used for their preservation." Dr. Palmer assumes that the failure of the operation in so many cases in which the teeth have been carefully filled with gold, amalgam, etc., is due to an electro-chemical decomposition of the tooth-substance, induced by the electric current set up between the tooth-bone and the material used for filling. He adopts the hypothesis that caries of the teeth is a result of chemical action, and is governed by certain laws of nature, known or unknown, and that the materials commonly used for fillings are simply agents designed to prevent this chemical action; that the cavity of decay is a cell, in which chemical decomposition goes on more or less rapidly until the surrounding walls are broken down. The cavity once filled, and the fluids, or

agents of circulation, being shut out, chemical action is arrested, and the tooth, we say, is preserved. The operation of filling teeth is generally regarded as a mechanical one, the law or principle upon which it is based being the exclusion of moisture. It is also considered that gold is the best material to use for the purpose, and that failure is the result of the inability of the operator to make a moisture-tight filling. Another and more natural theory is, that since caries is a result of chemical action, this action may be arrested in some specific cases, more effectually by the use of other material than gold, and in which gold would undoubtedly prove a failure. It is necessary to chemical action that two or more elements be brought to influence each other. There must also be a fluid or semi-fluid medium, in which the molecules are free to obey the laws of chemical affinities. All matter contains a greater or less amount of electricity in a latent condition, which, in the dry state, remains unchanged, as, for example, a tooth in the cabinet would remain for ages; but bring the tooth into contact with another element or compound containing more or less electricity of the opposite character, in a fluid that will allow circulation, and there will be an effort made to restore the equilibrium between the two bodies; one of which may lose both texture and form in its affinity for the other elements brought in contact with it, and that, too, by the agency of circulation induced by the presence of an element unaffected thereby. This appears to be a law governing all matter. The metals have been divided, according to their electrical conditions, into positive or negative when excited by a given solution in a Voltaic battery. Thus, in a battery constructed of copper and zinc plates, immersed in acid, the copper assumes the negative, the zinc the positive. Exchange the zinc element for one of gold, and the copper at once becomes the positive, and like the zinc, though in a less degree, will be consumed; that is, in consequence of removing the zinc plate, and substituting one of higher order than the copper, the latter becomes electrically changed, or of different polarity. The same is true of the current passing from the copper, as may be seen in testing with a compass needle. A change of solution from acid to alkaline frequently changes the polarity of the elements without removal or substitution of one plate for another. Dr. Palmer's ob-

servations have led him to believe that dentine, oxy-chloride of zinc, and amalgams are subject to the same law. When tested by the galvanometer, with saliva for the fluid, the following is the electrical standing of the elements used for preserving teeth, dentine being also included in the list: Gold, mercury, oxy-chloride of zinc, dentine, tin, amalgam and zinc; the latter is added simply to indicate the zero of the scale. By testing the same materials in weak acid, the order is reversed in some of the elements, as may be seen by comparison with the above: Gold, mercury, amalgam oxy-chloride, tin, dentine. Thus it will be seen that gold and dentine are the extremes of the list when excited by acid solutions, the latter becoming the positive element, or element acted upon. The law is that, between the extremes (of any correctly arranged list of materials) will be found the greatest chemical action. Between any two nearest together the action will be slight, as between platinum and gold, or tin and amalgam; so slight, indeed, that a change of temperature of the same fluid, as well as change of fluid, will often change polarity and reverse the action. Again, the current which passes from the negative element is termed positive, or bears the name of the opposite element. To be better understood we term the positive current the acid current, such being its action upon the element consumed as well as its action for acid tests, while the current which passes from the positive element, like the zinc in a battery, possesses alkaline properties, and so reveals its action. The latter current, in the ordinary galvanic cell, is confined to the fluid, passing only from plate to plate, while the acid current, so to speak, passes from pole to pole, ontside of the cell.

It may be argued against this theory, that gold, being a non-oxydable substance, can excite no action upon a tooth. But, as Dr. Palmer states, gold becomes an agent of chemical circulation, and, in consequence of its negative properities, does supply a decomposing current, which keeps the surface beneath a leaky filling in an irritable condition; while with any of the lower grades of materials, which stand nearly upon the plane of equilibrium with the dentine, less action is produced and less breaking down of the tooth structure results.

Tin, being the nearest to dentine, not only arrests decay, like gold, *mechanically*, in ordinary teeth, but in frail, chalky structures acts

as an ant-acid element, neutralizing fluids that otherwise would become acids. Thus we have antiseptic effects from tin in a specific class of teeth. Gold, in a well organized tooth, is the best filling, as dentine and enamel, in a normal condition, are non-conductors of the galvanic current, not liable to chemical action; consequently no harm arises from union of either with gold.

Oxy-chloride of zinc fillings, when submitted to the electrical test, stand nearly neutral to the teeth. Such fillings cannot promote chemical action injurious to the teeth, but the filling is not itself free from chemical action, and thus it cannot be relied upon as a permanent plug.

Amalgam, when compared with dentine, tin, oxy-chloride, etc., (contrary to previous opinions,) stands above in the scale, and is, therefore, in a degree, liable, like gold, to excite chemical action unfavorable to the tooth. This cannot be otherwise, as amalgams are composed of mercury, silver and tin, with the addition of other metals still finer. Tin being the lowest in the scale of oxydation, the compound is raised, as indicated by the test, quite above dentine or tin alone, which is a step in the wrong direction, for the antiseptic property is much needed in teeth where amalgam would be called for.

According to the theory advanced, if the compound of metals previous to amalgamation is finer than the mercury to be added, nothing short of a perfect combination can prevent the mercury from being acted upon by the current induced by the finer element. The effect of such action is visible in the fine pits and ragged edges upon the surface and margins of the plug, which, previous to chemical action, were filled with uncombined mercury. On the other hand, if the compound, previous to amalgamation, be nearly equal to or below the mercury, little or no oxydation will take place. The plug will present a smooth and even surfaee; the mercury will not be acted upon; the plug will give little or no evidences of shrinkage, and the compound, as a whole, will stand in favorable relations to the dentine.

Dr. Palmer believes that a proper understanding and application of the laws of chemico-polarity in the selection of materials for filling teeth would lead to a more judicious choice by the operator,

and in many cases in which gold is now used, other materials would be substituted and conscientiously recommended.

The amalgam question, if we may judge by the extent of the literature which has appeared upon the subject during the past year, is again prominently before the profession. Of the number of papers published, the two contributed by Drs. Hitchcock and Bogue to the Odontological Society of New York are especially worthy of consideration.

Dr. Hitchcock's paper relates more especially to the physical properties of amalgams. While this study is of the greatest importance in fixing the true value of amalgams for dental purposes, the study of the chemistry of amalgams must take precedence. Though we should have the *ne plus ultra* in amalgams, so far as relates to expansion, shrinkage or discoloration, still the unsettled question remains: Do these compounds effect injuriously the human system? These differences of opinion, honestly entertained by the profession, can only be settled by extended and carefully recorded observations, aided by the science of chemistry. If chemical investigations show that compounds of mercury are formed in the mouth in sufficient quantities to affect injurously the health of our patients, this would at once settle the question of the impropriety of the use of amalgams in dental practice.

Dr. Bogue, in his paper, gives the full details of a series of experiments particularly directed, he says, toward this mooted question. With this purpose in view, twelve specimens of amalgam were experimented upon, by carefully filling a tooth with each of the specimens, and then placing the filled tooth, together with a pellet of the same amalgam—first carefully noting the weight of each—in a bottle containing saliva acidulated with each of the following acids: nitric, hydro-chloric, citric and acetic, to a degree sufficient to act readily upon the enamel of the teeth. These bottles, forty-eight in number, were placed in a water bath and kept at or near 100 degrees of heat for three months. The teeth and pellets were removed singly, washed, and once more carefully examined and weighed.

Dr. Bogue, after a minute record of both the chemical and mechanical tests, with each of these specimens, concludes as follows:

"These tests were needed to enable us, as a profession, to say positively whether or not the mercury in an amalgam filling, or any number of amalgam fillings, properly inserted, could, by any possibility, cause mercurial symptoms, or mercurial poisoning with unrecognized symptoms. And, as has been shown, three months and over of chemical action so severe as to almost completely disintegrate or dissolve the enamel of most of the teeth subjected to the test, has failed to diminish the aggregate weight of the amalgam pellets that were subjected to the same tests as the teeth with their fillings, more than about three grains in nearly 11½ pennyweights. That is to say, the gain from the addition of oxygen by the oxydation of the surface of certain pellets has nearly balanced the loss of weight of certain other pellets, so that the pellets now weigh, in the aggregate, only about three grains less than at the beginning of the experiments, the copper being the greater loser; and copper amalgam is not used in this country, though it is in Germany."

To verify this statement, the fluids in which these teeth and amalgam were lying in corruption together, were carefully tested for mercury by Dr. Bogue, and also by Prof. Chandler, of Columbia College School of Mines, and none found in solution. After a few observations upon the physical properties of these amalgams, Dr. Bogue finally says: "It will be seen that, if almost any amalgam is used intelligently, teeth can be filled, not only so as to preserve them, but to do so without danger to the general health from any element of the filling, unless it be copper. Of this I am not sure."

A favorite method of conducting inquiries as to the physiological effects of amalgam fillings has been to form a hypothesis, and then calculate what would happen if the hypothesis were true. For example, it has been ascertained that certain free acids are found in the mouth, which are constituents of the salivary fluids. With the acid saliva, and the presence of amalgam fillings in the mouth, we have a chemico-polar arrangement, which results in the formation of the oxides and sulphides of mercury. The former, in the presence of hydro-chloric acid, is decomposed, and the sub-chloride of mercury, or calomel, is formed. Hence, we may have the usual constitutional effects of this active compound of mercury. These are the results, and if the actual phenomena agree with them, we

say the hypothesis is verified, but only so long as no other hypothesis is invented which agrees still better with the phenomena observed.

The experiments of both Dr. Bogue and Dr. Palmer, to which I have directed your attention, and the conclusions to which they have led, would indicate that there are irreconcilable differences of opinion among the members of our Association as to the physiological effects of amalgam fillings. But when members can free themselves from prejudice, and base their opinions upon the results of actual demonstrations, as these gentlemen seem to have done, it is evidence that progress is being made, and that ere long, through the aid of chemical research, the question, whether or not amalgam should be used, under any circumstances, as a filling for carious teeth, finally settled.

Dr. J. S. Cassidy, a member of the committee, contributes the following upon the subject of bleaching teeth:

A tooth, having lost all or the greater portion of its vitality, either through external encroachment of caries, or internal physical death, will, in nearly every instance, assume a more or less darker color than it possessed when endowed with active life; the increase of color being due to changes in the innate character of its own substance, or to the action of external bodies capable of introducing into, or forming with the constituents of the tooth, insoluble compounds which do not reflect all of the solar rays.

The decomposition of the earthy portion—viz: the calcium and magnesium phosphates, calcium carbonate and calcium fluoride—does not directly exert any appreciable influence in changing the color to a darker hue, inasmuch as disintegration of the part is accompanied by solution and consequent disappearance of the calcium compounds, or by the production, (in rare instances), of a calcium precipitate, which, if chemically pure, is destitute of color. Comparatively few organic acids, when acting on calcium compounds such as are found in tooth bone, are able to effect precipitates in saliva. This is also true with respect to the majority of the mineral acids, notably excepting those of sulpher. Sulphuric acid, reacting on calcium carbonate, gives insoluble calcium sulphate,

($CaSO_4$), and in this latter case the intimate mixture of the insoluble body with the nonputrefactive carbonized gelatin of the tooth, affords a protecting surface against further encroachment upon the bone beneath. It follows, therefore, that we are not to attribute the increase of color throughout the body of a pulpless tooth to chemical changes in the normal relations of its calcium compounds. Neither should it be considered as resulting solely from the presence of gelatinous residuum, as this tissue is naturally colorless, and if affected directly—*post mortem*—by chemical action, and its identity destroyed, a large portion disappears by its constituent elements escaping as gases. The degraded residue, however that may remain *in situ*, in connection with partially emptied interdentinal tubuli offers a most convenient receptacle for colored matter of whatever kind.

Nearly all of the gases and fluids whose development is concomitant with the so-called putrefaction of organic substances, are produced with peculiar facility in the oral cavity, and although some of them, as found in the mouth, are true, sharply defined chemical compounds, the greater number are held together in apparent heterogeneous association, in which the most delicate tests and processes in analysis are practically futile. Their general complexity of constitution, and favorable situation, admit of their indulging in almost endless reactions, the factors being scarcely less definite in their nature than many of the bodies thus formed.

Among the few well known gases that have been isolated in response to appropriate tests is hydrogen sulphide, the favorite reagent in every chemical laboratory. Through its influence a large per cent. of soluble metallic salts part readily with their metals in the form of precipitated sulphides, according to the insolubility of the latter in either acid or alkaline solutions. These precipitates—presented as but one example of the manner in which coloring matter may be formed in the mouth—possess varying degrees of color, and when formed in, or received into, a semi-diaphanous and porous substance like a deadened tooth, necessarily lend to that substance the peculiar shading characteristic of each.

To the question, "Can such teeth be permanently restored to their original color?" an affirmative answer, the writer thinks, at least as re-

gards the greater number, may be safely made; but as there is a positive tendency to the formation of undue quantities of dangerous acids by reaction of the agents ordinarily employed for bleaching, the process may result in an injury rather than a benefit, unless the utmost care, commensurate with the value of the organ, be observed.

It would be incompatible with the limited number of experiments made thus far in this connection to offer suggestions as to remedies that can successfully meet the requirements of each case, but if restricted to a single, though rational line of treatment, we would say that a simple method by which nascent oxygen is developed in sufficient quantity, is the best; and ignoring, for the present at least, a few minor experiments recently made with this object in view, the writer begs leave to submit a simple, though not altogether an original plan of treatment pursued successfully in a number of cases in actual practice and otherwise.

One of the most remarkable recognized properties of the element chlorine is its bleaching power, a property, however, which is manifested only through its ability to develop free oxygen from water. Dry chlorine does not bleach; there must be moisture present in order that it may exert its affinity for hydrogen, and thus set oxygen free, which latter element, in its *nascent* state, attacks the coloring matter, and forms with it compounds that are destitute of color. The writer's experience in bleaching teeth has led him to believe that pure, unadulterated chlorine is the best agent to employ for this purpose. A safe way to obtain pure chlorine in any desired quantity for convenient and cleanly application to a darkened tooth is by reaction of hydrochloric acid on black oxide of manganese. Take a small retort, or flask, to which is attached, by means of a perforated cork, a properly bent glass (or rubber) delivery tube two or three feet in length, and one-half inch in calibre; then pass the other end of the tube through the open mouth, and to the bottom of the receiver. Place in the retort three parts strong hydrochloric acid and one part of finely pulverized black oxide of manganese, and agitate the mixture; next insert the cork containing the delivery tube and apply a gentle heat. The manganese parts with its oxygen, which latter element appropriates all the hydrogen of the acid; one-half the chlorine of the acid unites with the manganese to form manganous chloride, and the portion of

chlorine set free passes through the delivery tube to the receiver. ($Mn\ O_2 + Hcl = Mn\ cl_2 + 2\ H_2O + 2\ cl.$)

On account of the high specific gravity of chlorine, it may be collected by simple displacement of air. An ordinary small bottle will serve admirably for a receiver, and when full—a fact easily ascertained from the yellowish-green color of the gas—the bottle should be closed with a cork. A most convenient apparatus for immediate conveyance of the gas to a tooth is made by merely inserting through the cork of the receiving bottle a straight glass tube six or eight inches long, the upper extremity being drawn to a point, and having a small aperture, which is stopped with wax except when in use. The tooth should be isolated by means of rubber dam, and this material should also be placed over the mouth and nostrils of the patient, in order to prevent possible inhalation of the irritant gas. By inverting the receiver—having its cork and containing glass tube in position—and applying the tapered point of the tube to the cavity, the surface of which is allowed to remain somewhat moist, the gas, being considerably heavier than air, will pass downward through the tube into the interior of the tooth, an observable whitening of its substance being, in a majority of cases, the immediate result.

Dry chlorine, as before remarked, does not bleach. Either the colored substance must be in a state of solution, whereby colorless chlorides can be produced, or moisture must be present to induce the development of nascent oxygen; aud in regard to the reaction that occurs when chlorine is applied to a tooth, as herein described, the characteristic affinity of the element under the circumstanees, and better still, subsequent tests, prove the formation of hydrochloric acid, a fact which suggests nascent oxygen as the active principle which successfully changes the coloring matter into colorless compounds. An equivalent of water undergoes decomposition by abstraction of its hydrogen to satisfy the chlorine, a process which occasions coincident evolution of free oxygen. ($4Cl + 2H_2O = 4\ H\ Cl + 2\ O.$)

It is well to remember that hydro-chloric acid (Hcl) is destructive to tooth substance, especially to the calcic portion, and, therefore, the immediate use of an alkali, such as lime water, is recommended to neutralize its baneful power; otherwise disintegration of the

part will proceed in proportion to the amount of acid produced. It may also not be out of place to remark in this connection that the writer's experience in generating free chlorine by the action of acids on bleaching powder—a process frequently adopted for this purpose—does not agree with preconceived favoring opinions on the subject. The disappointment being, perhaps, not merely due to possible deterioration of the powder, which at best contains only a small per cent. of available chlorine susceptible of being liberated by an acid, but, in all probability, rather to the liberation of hydrochloric acid in excess before reaching the final point of oxydation. Bleaching powder appears to be constituted of calcium hypochlorite and calcium chloride, and if acted on by an acid (oxalic for example) it yields its chlorine only after intermediate acid-forming stages, according to the following equation:

Bleaching powder,	Oxalate acid,	Calcium oxalate,	Hypochlorous acid,	Hydrochloric acid,

$$Ca\,cl_2 + Ca\,Cl_2\,O_2 + 2\,C\,H_2\,O_4 = 2\,C\,Ca\,O_4 + 2\,H\,cl\,O + 2\,H\,cl.$$

The free hypochlorous and hydrochloric acids react on each other, yielding water and free chlorine, ($H\,cl\,O + H\,cl = H_2\,O + Cl_2$) which latter bodies are converted into hydrochloric acid and nascent oxygen, ($H_2\,O + 2\,Cl = 2\,H\,cl + O$.)

DISCUSSIONS.

Dr. Palmer: As I have been freely quoted upon this subject, and as it is a branch of study which has not before been presented, perhaps I ought to condense and explain rather briefly the matter already laid before you.

I wish to say, with reference to the application of this theory, that there are two distinct classes of teeth which come under our care. The first are those which are well organized, or in a normal condition, except that they have become decayed and demand our

attention. For such I use and recommend the same as others, viz: gold; because there is nothing objectionable in the material, and it is a purely mechanical operation, plugging the cavity, excluding the moisture, and checking the chemical action.

There is another class of teeth, of a chalky and undeveloped character, which require our attention, and which are to be treated differently. We find examples of this class in the six-year molars of children. In such cavities the experiments I have been making for some years demonstrate that gold is not the best preservative agent. Tin better serves the purpose in such cases, and the reason of it is clearly answered to my mind by known principles of chemical and galvanic action. Take the action we have witnessed in the galvanic cell. We place in the galvanic cell any two elements, usually one higher and one lower, as copper and zinc, carbon and zinc, or platinum and zinc, because the further you get the two elements apart, the higher the one and the baser the other, the greater is the chemical action. Now any substances that are influenced at all by chemical action, are elements subject to galvanic action, and the one assumes, when brought into contact with the other, the positive pole, and the other the negative relation. Those relations are changed by the temperature of the fluid, and by various fluids, whether alkaline or acid, but, nevertheless, they hold those relations instantly when brought into contact with each other. The idea has been advanced that only metals or certain minerals were elements to form this galvanic action, but on experimenting and measuring the current we find that dentine as well is an element, to be arranged by the side of gold or tin, and we also find that the different materials used for filling hold the same relation as the copper and zinc in the battery. Now, the destruction of any one of those elements is in proportion to the galvanic current produced, or the chemical action going on in the cell. Well organized dentine is a non-conductor; insert the gold and make a moisture-tight plug, and the tooth is preserved for an indefinite time. But in a porous, poorly organized tooth there will be circulation, or moisture allowing circulation through the pores of the dentine. You have placed there an agent of chemical action. The gold is not influenced, but becomes like a platinum plate in a battery. Amalgamated zinc will

stand for years, until you make a connection of the poles, and then the zinc, being the positive element in producing the current, is destroyed. Just in that relation stands the dentine when filled with gold. If porous, then the action is thrown upon the dentine. You will find in such teeth that in one, two or three years the filling becomes loosened, or the bone softened under the filling, and we can measure it by the galvanometer and see the deflections produced.

Some, as, for instance Mr. Fletcher, claim that the greater antiseptic properties of tin, as compared with gold, are due to the plasticity of tin; its adaptation to the walls of the cavity. It is something more. In comparing the relation of the tin and dentine they stand in almost the same electrical condition. It is the law that when two bodies stand thus, there is little or no chemical action. Now, when tin is placed in the condition in which we find it in the mouth, the tooth substance assumes the negative relation, while the tin is rendered the positive element, to be consumed. There may be a slight oxydation of the tin, but no corrosion or oxydation of the tooth. The action is so slight that it would be almost imperceptible, because the loss is going on in the plug itself, and that only upon the surface. But put the same elements in an acid solution, and the order is slightly reversed. In an acid condition the action would go on in the dentine, and the tin would not be affected. On the other hand, if we substitute gold for the tin in an acid condition, we shall have the most decided action.

Now, in relation to amalgam, my experiments by the same test have somewhat changed my views in regard to it. There is nothing I have tested which is so close to the electrical condition of dentine as tin. Amalgam stands nearer to gold. The more porous kinds, however, are much like tin. Now, the idea of improving the antiseptic qualities of amalgams by making them finer, is absurd. Supposing we had gold and mercury; we have raised the standard so far above dentine that it would be, perhaps, fifty per cent. more than tin. If there were no injurous effect from zinc, it might be reduced to about the same electrical condition as dentine.

In mercury with silver we find some of the same objections as obtain against gold; it is higher, electrically, than dentine. Again, when we take any two compounds and bring them together in con-

ditions in which the current can be established, that current, passing out from the finer to the coarser, is an acid current. Take the battery, for instance, having a platinum plate and a zinc plate. The current passing from the platinum around to the zinc, when tested with litmus paper, gives an acid stain. The current passing from the zinc through the fluid to the platinum, gives an alkaline stain. Placing a tin plug in the tooth, we have simply placed there an alkaline element. Thus we have the tooth in its neutral or normal condition, being exposed to little chemical action. This is the law which we have been searching for. The current, in passing from the finer element, the platinum, to the zinc in the outside of the jar, is acid, which may be irritable to the dentine. That passing from the zinc through the fluid to the platinum would correspond to the alkaline.

I do not wish to be understood that it is the galvanic action going on which destroys the teeth. I am not prepared to say whether the chemical action furnishes the galvanic current, or the current induces galvanic action, and I am not able to say which is the destroying agent.

In relation to the teeth we must act intelligently. We cannot build up a tooth contrary to the laws of chemistry. The tooth is of such a structure that under such circumstances it is impossible to make a durable plug.

A MEMBER: I would like to ask Dr. Palmer what he considers the best materials for amalgams.

DR. PALMER: I present any views upon this subject with a great deal of hesitation, and in attempting an explanation in that direction I hope it will not be considered that I would recommend amalgam generally for plugging teeth. The cases are few which demand amalgam, but when that is used, it is desirable to use it according to chemical law, and use the best material.

I will say here that tin, if it would stand the abrasion, would be preferable to amalgam, because the elements composing amalgam are above those of tin as compared with dentine. Any attempts to improve an amalgam by the use of gold, platinum, etc., is in the wrong direction. In amalgams made of coin we have the metal and the mercury, two elements to be blended; and this composition

is often chemically composed so that it represents but one metal. In the old coin amalgams we had a material that preserved some teeth very well, but there was always an oxydation, more particularly from the copper. It penetrated or was received into the dentine. It might be years before this discoloration would reach the pulp, but when it did so its effects were poisonous, and liable to destroy the vitality of the dentine and pulp.

In preparing the composition we must oe careful not to get a metal so base that the oxyd of it will be destructive. Tin seems to be least objectionable. On the other hand, supposing we get an ingot of superior fineness; supposing it is composed of gold and platinum. In order to preserve the physical relation of the amalgam, or make it hard enough to stand attrition, it has been prepared fine. When we compound it with mercury, unless there is a perfect union, we will see the same effect that we used to see from the fillings of silver coin; we will see the mercury dissolved, leaving edges of the plug ragged, and the whole plug porous. And why? Because the composition of the amalgam was of such fineness that it became the negative element, and rendered the mercury positive. The amalgam should be of such composition that the metal and the mercury shall be in about the same electrical state of equilibrium. Then there will be no dissolving of the one or the other. We must get the amalgam in that condition in which there shall be no chemical action in the elements of which it is composed, and at the same time have the mass correspond in electrical condition with the dentine. In some of the amalgams of the present day we see that almost attained; so nearly so that there is very little discoloration, and no roughening of the surface of the plug. As I said, in any effort to make the amalgam too fine, you will preserve those fine metals at the loss of mercury. If the mass of metal is below that of the mercury, the latter will not leave it.

THE PRESIDENT: The idea has been suggested, whether an application of creosote to the dentine, to make it dry and compact, would not induce this condition, so that gold might be used in those cases in which you say tin is best.

DR. PALMER: There is one figure that will express my idea as to the difference between gold, tin and dentine, better than any thing else, and that, perhaps, will answer your question.

We will suppose that an iron tooth was worn in the mouth, and that a place in that tooth needed filling. What sane person would have that tooth filled with gold, knowing anything of chemistry or galvanism? Would he not rather put in a zinc plug? With the former you reduce your iron tooth to the positive condition, while the gold is decidedly negative; the corrosion is entirely upon the iron, and it is affected more than if the gold plug were not in it.

The theory I have introduced brings dentine into the same position as the iron. It is rendered positive or negative to the plug coming in contact with it.

Some two years ago I inserted a partial gold plate for a gentleman, who returned very soon saying that it caused a flow of saliva to collect in such a manner that he could not wear it. I understood at once the trouble, but the remedy did not suggest itself immediately, but it occured to me to boil it in strong soda. I did so; he went on wearing it, the system became changed, and he wears it now without difficulty. This boiling merely changed the surface of the plate somewhat. That was negative, the system was positive, and the cause of this salivation was a changing of the alkaline secretions of the mouth into acid. I do not wish to be understood as saying that the galvanic current destroys the teeth, or eats away the dentine. It is simply an evidence of chemical action, and where that is going on there must be destruction of some of the elements.

Dr. Taft: In a great many instances where gold and amalgam fillings are in the mouth, it is found that the dentine immediately about the borders of the gold filling has become softened and decayed, while about the amalgam filling no such decomposition takes place.

Dr. Palmer: As I have already said, the gold, or the negative element, sends out from itself an acid current, while the lower metal, which may be amalgam, or tin, produces an alkaline current, which harmonizes, in its electrical condition, with the dentine, and you will find it in a state of neutrality. Adjoining the gold producing the acid current you will find a dissolving of the lime salts in consequence of the wasting of the fluid.

Dr. Taft: Do I understand you to say that this electrical cur-

rent produces the acid current, so as to act chemically upon the lime salts?

DR. PALMER: Yes, sir; that is the idea.

DR. TAFT: Is it not by decomposition of the fluid in that immediate vicinity; by decomposing and recomposing an acid at that point?

DR. PALMER: I have in my laboratory a LeClanche battery, and in that stand two elements, one an amalgamated zinc rod, not over two or three ounces in weight, standing in a solution of muriate of ammonia, in a porous cell. That stands there just as your filling stands in a tooth. They will remain two or three years, no action going on; but simply connect the poles and you have got a strong current that will dissolve both elements in this case. I cannot tell you whether the chemical action produces the current, or the current the chemical action.

DR. TAFT: Does decomposition naturally precede the electrical movement or current?

DR. PALMER: That would probably be the case in the instance you cited, in order to establish a current, but if you get a current you get decomposition instantly, and in two elements where we do not know which way they stand, if you immerse them in a solution they instantly assume the positve and negative relations. Now, take the same two in another solution and you may reverse them, or even in the same solution at a different temperature. It is in consequence of the action of a circuit, and in the case cited it is increased by the presence of the two fillings.

DR. TAFT: It has been stated by some that the vapor of mercury will not pass into dentine. Why is it that dentine is frequently found discolored, even into the root sometimes?

DR. PALMER: I regard that as an oxydation of the plug. It may be mercury, but more probably copper. When we used fillings containing copper we saw more of this. By capillary action it is drawn into the dentinal tubuli, in consequence of the tooth being in a porous condition.

DR. OSMOND: In regard to the action of amalgam and gold fillings when placed in the mouth, I have noticed that the dissolving of the dentine around the fillings takes place generally where there

is an acid condition of the mouth. Chloride of sodium is found in large quantities in the human body, especially in the saliva, and we have, in such cases, decomposition of that binary compound, and the elimination of acids around the gold filling, or negative pole. The acids have a particular affinity for the phosphate of lime and calcareous salts of the dentine, dissolving them and leaving the animal portion there.

In regard to the discoloration of the dentine by the presence of amalgam, you will generally find in old-fashioned amalgams, containing a large proportion of silver, the greatest discoloration. In that case, the silver has been oxydized, and combines with the albuminous portion of the teeth, forming an albuminoid of silver. I have noticed in amalgams containing a large proportion of tin, that there is not the same amount of discoloration that there is with the old-fashioned amalgams; and also, where tin is a constituent, that the shrinkage is less than otherwise. But I do not advocate amalgams, and I rarely use them. I have seen many a good gold filling rendered entirely useless by the presence of an amalgam filling in its vicinity. Where the secretions of the mouth are acid, we find the most difficulty from amalgam. In certain cases where there was considerable sensitiveness I have taken a little of the silicate of soda, varnished the cavity inside, allowed it to dry, and then touched it for an instant with a little sulphuric acid and water, and then carefully wiped it out, leaving a film of the silicate inside the cavity. Then washing it out afterward, I have inserted the filling and no sensitiveness remained. We protect the cavity in that way by means of these little portions of silicate around the filling. It is perfectly insoluble, and there appears to be no direct contact between the gold and the dentine. This remedy was suggested to me by some experiments I had been trying in frosting glass.

Dr. Taft: I have been exceedingly gratified at the remarks of Dr. Palmer, though he does not go so far as we would like to have him go. I regard this branch of so great importance that I think every man ought to endeavor to do something towards its advancement in the way of investigation.

Now, it may be that hitherto amalgam has not answered the purposes for which it was used, as it should have done; indeed, I very much doubt whether it ever will be brought to any great state of

perfection; whether the requisite knowledge concerning its properties and management will ever be attained to enable us to so use it as to answer reasonable expectations, but if it is to be used, we should understand it as thoroughly as possible.

This material has, however, been very imperfectly understood by the great mass of the profession employing it. "Dental depot men have told me, within the last two or three months, that they are selling largely increased quantities of amalgam." That remark has been made by those purchasing when asked, "Why are you using so much amalgam?"

The articles upon this subject, submitted at the meeting of the New York Odontological Society, December last, let in new light in this direction. Those articles, if they prove anything, prove that amalgam is an unfit material with which to fill teeth. Take, for instance, Dr. Cutler's article. Each of the compounds with which he experimented he found unfit to fill teeth with. The other experimenters, in the same direction, arrived at very much the same conclusions. It is true that the scope of these experiments is somewhat limited. The direction in which Dr. Palmer is experimenting was not touched, or was barely touched, by them. Physiological influence, and the diversity of that influence upon different individuals, was not referred to at all. Now, these are the great subjects. It is not merely whether the amalgam will contract in the mouth, or become dark colored. The real question is involved in the principles laid down by Dr. Palmer.

The chemistry of bleaching teeth is an important subject, and one which is but very imperfectly understood. If a practitioner finds something which, in a given case, brightens a dark hued tooth, he thinks he has something that will effect that change in all teeth, leaving out of view the varying condition in which we find them, as well as the character of the union producing the discoloration. Now, the discoloration of a pulpless tooth is produced by various things. In most cases, when a tooth becomes devitalized, there is some change of color. This is especially the case in the teeth of young persons. In another class of teeth this change takes place on account of a change of the soft-solid substance of the tooth immediately after its devitalization, and the larger the amount of such

material in a tooth, the more definite will be that change of hue when it takes place. In this state of things, its restoration to its original color is a difficult matter. If the discoloration depends upon the presence of some coloring matter in a cavity, in some kinds of teeth there may be but a very slight penetration of the walls, and yet the coloring matter shines through so as to give a dark cast to the entire tooth.

In such cases it is quite sufficient to excavate the thin lamina of dentine holding it; but sometimes this is hardly practicable, and it may then be necessary to introduce chemical agents in order to decompose the coloring matter. What those agents shall be, will depend upon the nature of the coloring matter. Sulphuric acid will decompose a certain kind of coloring matter in certain teeth, but apply it for the same purpose in other teeth and it has no influence upon them. It is so, also, with cyanide of potassium, with all the agencies employed thus far. There are cases in which even oxygen itself will not reach the difficulty.

Chlorine, as has been remarked, is a great bleacher, and it will effect the decomposition of the coloring matter so far as it reaches, but if that matter lies beyond its reach in the dentine, it will not remove the discoloration. If the tooth is blackened to a great extent by an amalgam filling, by oxyd of mercury or tin, the probability is that oxygen will not effect its removal.

Dr. Rehwinkel: I was most highly gratified by the remarks of Dr. Palmer, and I thank him heartily for the result, limited as it may be, which he has laid before us. This theory explains a great many things for which I never could find before a satisfactory solution. In looking over the results of my work for the last fifteen years, in cases where I have taken every precaution that I knew of to insure success, I have found inroads upon my work which I could not account for. And I have frequently been impelled to ask, "Why is it that the filling is there, and the tooth has left the filling? Why is it that apparently the closest joint has been undermined?" The filling remains good sometimes for years, and then all at once a morbid action springs up in the tooth, and you can see it extending rapidly. There is a morbid chemical action set up in the mouth, which is destructive to every thing it comes in contact with. That may last some time, and then subside of itself.

Another question I have never been able to solve satisfactorily is, why tin, in certain cases, is so much preferable to gold. My explanation has always been, that tin foil, or at least the oxyd of tin foil, possesses peculiar medicinal properties, arresting chemical action upon the teeth.

Another question is, why, in filling children's teeth, do we sometimes succeed better by using a plastic filling than by using gold?

These subjects have occupied my thoughts for a number of years, and I cannot express my gratification at being put upon the right track and confirmed in my theory that these changes depend not only upon chemical action, but upon another force less understood in its operation.

I come now to the question of amalgam, one which we ought to touch lightly and with kid gloves. The experiments of Dr. Bogue and others have shown us that an amalgam, to be of any use, must stand upon its own merits, and not depend upon the reputation of the maker. Through those experiments we know definitely, in regard to the contraction in different kinds of amalgam, as to which is preferable in other respects. Bnt I should be sorry to see amalgam raised to much dignity as a subject of discussion, for fear that it might extend its use. While there are some practitioners in whose hands it is safe, it would be very unsafe in the hands of the great majority. If we discuss and recommend this or that amalgam, it will prove in operative dentistry the same curse that gum has proved in mechanical. I am not going to say that amalgam should not be used at all. On the contrary, I would sever my connection with an Association forbidding me to do so. I want to be untramelled in the matter, but in using it I shall always want to know thoroughly the grounds of my choice.

Dr. Hunter (Mich.): I am practicing in a small town of 1,500 inhabitants, where the people have been taught by traveling dentists that amalgam is as good as gold. These men will work for half price, and they tell people that gold is only used in front teeth for the sake of the looks. I have myself become disgusted with amalgam, and have put in but one filling of it since 1874; but some of my patients have left my office never to return because I declined to use it. These difficulties, which are encountered in a small town, are well worthy of the attention of the Association.

DR. DABOLL: Several years ago I had under my care one or two patients who had spent some time in Germany and been under the care of Dr. Abbott, of Berlin. In the third molar in each of these patients I observed a peculiar filling. At the time I could not understand why it was put there, or what the combination was, although, as near as I could ascertain, it was a combination of gold and tin. The ladies could neither of them tell me the conditions which required such a combination, and I did not know, until Dr. Palmer commenced his investigations, what the materials were, or what they were put there for. But, in reading over the minutes of the American Dental Association, of Europe, meeting at Geneva, I noticed that Dr. Abbott read a paper in which he stated that, in teeth where embryo calcification had taken place—for instance, the third molars, or the teeth of children from ten to twelve years of age—he had been using a combination of tin and gold, and had met with much better success in preserving such teeth than with gold alone. He gave this as his experience, without explaining the reason, and it was not until Dr. Palmer commenced his experiments that I got the philosophy of it.

I have been experimenting some years upon the teeth of children, especially where the teeth were of a chalky character, filling them with a combination of gold and tin; filling the cavity about half full of ordinary tin, and finishing with gold, and so far as my observations have extended, I have found the result favorable.

REPORT

ON

OPERATIVE DENTISTRY.

By S. H. McCALL, of the committee.

(INSTRUMENTS AND APPLIANCES.)

It was thought best by your committee to make a division of their labors, each member confining himself to some special branch of the subject. A brief mention of some of the more important instruments and appliances will constitute the substance of this report.

The past year has, perhaps, been less prolific than some others in the production of new instruments and appliances, though it has witnessed some notable improvements in many of those already in use. Standing at the head of those of more recent date is the Burring engine. It has come to be regarded as an indispensable adjunct in every well appointed operating room, and its usefulness is now too well known to need any discussion.

Quite a number of styles are now in use, though the "Elliott Suspension" and the "S. S. White" are unquestionably the leading

engines of to-day. Both have been greatly improved during the past year as to the power and steadiness of their running qualities, the facility with which they can be brought into use, and the elegance and perfection of their finish. Totally unlike in principle and mechanism, they yet both deserve the title of "first-class" engines.

The hand-piece of the Suspension engine has been reduced to about one-half its original weight, and the ball at the end has been replaced by a fly-wheel attached to the shaft, which carries the bur. This gives balance to the instrument and tension to the driving-belt, at the same time increasing its momentum and steadiness. The engine has been greatly improved in other respects; but as it will doubtless be on exhibition at this meeting, any further allusion to it is not required.

The "S. S. White" engine, although one of the latest in the field, has been so extensively introduced that it has already gained a wide-spread popularity. Combining some of the good points of the original "Morrison," it brings out as its special and distinctive feature a *flexible shaft*, running through a flexible sheath. This gives greater facility of action to the hand-piece than has been attained by any other except the Suspension, while the power and speed are all that could be desired. The greatest difficulty in its use has been in running large disks, but the improved cables lately manufactured have, in a great measure obviated this objection. The spring pitman is another novel feature of this engine, and adds greatly to the perfection of its running qualities. Its new right-angle attachment is undoubtedly superior to all others, and so made that it can be applied to the hand-piece without removing the shield.

The air injector, or automatic chip-blower, is an ingenious appliance that is used in connection with this engine. It consists of a small rubber bulb or bellows attached at the upper end of the flexible shaft, and connected by a slender rubber tube with a nozzle fixed on the hand-piece. By the working of a simple mechanism at the pulley a continuous stream of air can be forced into the cavity, thus keeping it clear of bone dust and cuttings.

The "Fountain Mouth Protector," and "Ives' Tongue and Cheek Protector" are both neat little appliances to be used in connection with Arthur's disks. The former has a small rubber bulb for supplying water to the disk. This is fitted to the "S. S. White" engine, the other to the Morrison.

The Morrison engine, as remodeled and improved, claims advantages over the original form, and certainly presents a very neat and attractive appearance. Still, it probably does not come up to the standard of either of those just named.

The electric engine has come in for its share of improvements, and is very popular with some of our best operators. It seems to possess all the force required, and has the further advantage of supplying its own driving power. The weight of the instrument, and the noise produced in running it, must ever constitute some objections; while its liability to get out of order is greater than any other. Several styles are now in use.

The Pneumatic engine, although it has been pushed aside to make room for others, yet deserves a passing word of commendation. It was the pioneer in its line, and supplied in its own humble way, a want long felt by the over-worked dentist; and if it failed to do all that was expected of it, it at least opened the way for the perfection of better ones.

The "San Francisco Dental Engine" is probably the latest aspirant for public favor, and is offered for a much lower price than any other. From its description, and the cut which accompanies it, it would seem to be a modification of the "S. S. White" engine. It is designed more especially to run a dental mallet. Its extreme simplicity is one of its best features.

The equipment of burs, drills, polishers, burnishers, disks, etc., etc., which is now provided for all the principal engines, is most complete, and seems to meet the requirements of almost every possible case. Great improvements have been made in this department during the past year, and due credit should be given to the enterprising men who have brought about these results. Still, it is to be feared that many who purchase engines do not avail themselves of these advantages, but are trying to get along with only a scanty outfit. This mistaken idea of economy has caused many to underrate the real value and usefulness of the engine.

In regard to corundum disks, although they are invaluable, yet their extreme brittleness is a source of great annoyance. Dr. Bonwill has presented a disk of hard rubber instead of shellac, which he claims does excellent service, rarely breaks, and will last a long time. If Dr. Bonwill's idea is correct, it is to be hoped that it may be carried out, and that an improved disk may be put into the market at an early day.

Hickman's disk-carrier is quite a useful adjunct to the "S. S. White" engine. The occasions for its use are not very frequent, but there are some positions in the mouth which cannot, without great difficulty, be approached with a straight mandrel, which can be easily reached by this instrument.

Since the introduction of dental engines, numerous experiments have been made in trying to bring out the best motor for driving them; and the necessity for some power besides the foot is daily becoming more evident. Electricity, steam, water-power, and machines worked by springs or weights, have all been tried with more or less success.

The experiments with electricity have not been pushed far enough to warrant a decided opinion as to its merits for this purpose; yet there can be but little doubt that it will yet be made a cheap and practical motor.

Small steam engines have been made to run the Morrison engine, and perhaps others; but it is doubtful whether their advantages are sufficient to counterbalance their objections, which are quite numerous. Practical machinists and engineers might succeed with them, but their general use for this purpose is quite improbable.

The "Union Spring Motor Company," of Boston, have constructed an apparatus which is said to work well; and other machines operated by springs or weights have been tried with varying success. The ingenuity which has accomplished so much in other departments, will doubtless soon perfect something practical in this line.

To those whose offices are supplied with water, with a sufficient pressure, the water motor offers advantages over all the others. There are several kinds in use, but the "Backus Water Motor" is the only one of which the writer has any practical knowledge. A

trial of nearly a year has fully demonstrated its utility and perfect success.

Next to dental engines, in importance and usefulness, come the mallets—automatic, electric, pneumatic, and the various kinds of hand mallets. Nothing especially new respecting the latter has been brought out during the year, and there is still a great diversity of opinion among our best operators as to the relative merits of light or heavy ones. Those occupying a middle-ground between the two extremes are probably attaining the best results.

The pneumatic mallet is not very largely used, but seems to be quite popular with a few good operators. It is always ready for action, and not liable to get out of order, but the difficulty in getting rapid blows will probably constitute an objection to its general use.

The electric mallet has its warm friends, and staunch opposers—probably more of the latter than the former. It is used successfully and with entire satisfaction by some of our best operators, and is said to be more agreeable to the patient than the hand mallet, or the ordinary automatic. The extreme rapidity of its blows give it advantages not possessed by any other plugger; while the great weight of the instrument must ever constitute a serious objection to it. Some decided improvements have been made during the past year in its mechanism and working qualities, and its popularity is evidently increasing.

Your committee is not aware of any recent improvements in the Snow & Lewis plugger. It has come to be one of the standard instruments, and is deservedly popular.

The Baxter Automatic Plugger claims some advantages over other kinds, and is highly endorsed by some of our prominent men.

The automatic plugger invented by Prof. Buckingham, and recently adapted to the "S. S. White" engine, is undoubtedly the best thing in its line that has been brought before the profession. For over a year the writer has been using a plugger which, though differing somewhat in its minor details from this one, yet was so much like it in principle and mode of action that an opinion based on these experiments will apply equally well to the one under consideration. The instrument was attached to the "S. S. White" engine, and driven by a Backus water motor, and has proved a per-

fect success. The work has been easier for both operator and patient, and the packing of the gold has been quite as thoroughly done as by the ordinary process, and in much less time Patients invariably express a preference for it, and seldom exhibit any signs of flinching under its use. A careful comparison of the two instruments, and a short trial of Prof. Buckingham's, has left no doubt of the superiority of his, in several important particulars. It will undoubtedly be exhibited on this occasion, and its good qualities will be recognized on even a casual examination.

The same spirit of enterprise and ingenuity which has brought forth these large and more complicated appliances, has also been busy in inventing and perfecting those of minor importance. To describe them all would transcend the limits of this paper, and only a bare allusion can be made to a very few of them.

Quite a number of new rubber dam clamps have been devised, so that almost every possible case has been provided for.

Bancroft's clamp has a projecting wing on one side, which serves as a tongue or napkin holder.

Dr. Hickman has made a double lipped clamp, which is quite useful when one side of the tooth is broken down badly. The rubber is punched and stretched over the lip of the clamp, and then the clamp and rubber are expanded and applied both together.

Several new forceps for applying the clamps have also been put into the market.

"Jarvis' Separators" comprise a set of four neat little steel appliances for separating the teeth, preparatory to filling or applying the rubber dam. By means of a screw the jaws of the instrument are forced between the teeth, and the desired separation is accomplished immediately and with but little pain.

The tape forceps, or spring locking pliers, designed by Dr. Bogue, is a very convenient little instrument, designed for removing wedges, ligatures, etc., from between the teeth.

The new rubber dam buckle devised by Dr. Magill is quite an improvement on the old appliance, as it stretches the rubber tightly and smoothly over the lips and cheeks, without the use of weights, and so that it is entirely out of the way of the operator.

Large additions are being made each year to the already long list of pluggers, excavaters, chisels, etc., etc., till we now have an

almost endless variety of them. While this spirit of progress is to be commended, yet a too great multiplication of instruments may become a hindrance instead of a help in our operations at the chair. The dentist will generally save time and accomplish better results with a few well selected instruments, than by loading his operating stand with a great variety, which almost always confuses him. Success is not always attained by the same means, or in the same direction. The appliances that would enable one man to do good work may be entirely unfit for another, though equally skillful. From the ample field now open let each one draw those auxiliaries which will best fit him to do his duty well and faithfully.

SUPPLEMENTAL REPORT

ON

OPERATIVE DENTISTRY

By C. S. STOCKTON.

Mr. President: A word of explanation. I regret the absence of the chairman, Dr. Geo. H. Cushing, who is so well qualified to make the report on operative dentistry; and this regret is intensified, as there has been a misunderstanding in the committee in regard to the division of their labors. Being the last one upon the committee, I consented to prepare a short paper upon dental appliances. Since my arrival here the paper of Dr. McCall (just read by me) came into my hands, it being a very full paper upon the same subject; hence, there is no report proper upon operative dentistry.

It is a law of nature, unchanged and unchangable, that the gratification of one want brings another to take its place; and this is singularly the case in regard to the wants filled and unfilled by dental appliances. With the introduction of the rubber dam the thought was, now has dentistry become easy. But the spirit of the age has seized upon the professional mind, and invention is the thought of to-day.

What we have now in this line is far beyond the wildest dreams and anticipations of the first projectors; yet to-day ambition is just as active, and complaints a great deal more numerous than when the first dental engine started on its experimental "bore."

We desire speed and safety, better work and less labor. Unrest and haste are every where. We are always in a hurry to accomplish the given task. Invention is apace with the thought, and to this end I call your attention to the electro-magnetic mallet. No stronger language could be used in favor of any human device than that employed by Profs. Truman, McQuillen and Arthur, and Drs. Jack, Darby, Webb, and others. If we can regard their word as worthy of consideration, we must consider this instrument as scientifically amd mechanically of the greatest importance to the dental world, and second to no adjunct save the simple rubber dam. One-half to two-thirds the time is saved. The inventor has packed two books of number five foil into one filling, comprising the entire crown of a superior molar, in seventy minutes. The larger the cavity the more time saved proportionately. It is as easily handled as the pen. The pain incident to such operations is comparatively nothing. It is claimed that one-sixth more gold can be packed into a given cavity than by any other method. The most delicate walls are preserved, as well as the firmest tooth structure. The most delicate blow can be given, and the next moment the heaviest. Every pulsation is under the will of the operator. And the least of all claimed for it is that the operator is so greatly relieved from nervous and muscular loss and exertion, that a new lease of life is given him. The mallet has been very materially revolutionized by the inventor, and has been reduced about one-third in size, and is now so simple that any one can, if necessary, duplicate any of its parts. It is now almost noiseless. It is gratifying to announce that Dr. Bonwill, of Philadelphia, is most unanimously accorded the honor not only of having been the first to conceive, but to give us the first truly practical instrument; and we consider this acknowledgment no more than justice to him as a member of our profession. Let us rise to a sense of our duty, and hail the inventor as one of us, and hasten to acknowledge an instrument which promises as much in our calling as the telegraph or sewing machine in their departments.

I would also speak of the diamond (black) reamer of Dr. Bonwill. It is a very useful instrument in cutting away the palatine and lingual surfaces of superior and inferior incisors, leaving their beauty intact and enabling the operator to fill without any wedging. It can be used for the "anticipation of decay," where it is claimed an "ounce of prevention is better than a pound of cure."

Dr. T. L. Buckingham, of Philadelphia, has invented an automatic plugger, adapted to the S. S. White engine, which is a very ingenious contrivance, and a most valuable assistant to the operator who uses the S. S. White engine.

Dr. Gaylord, of New Haven, has also very greatly improved his pneumatic plugger, so that it is under the control of the operator, and the lightest or heaviest blow is given at will, and, with the engine, can be run at great speed.

My attention has also been called to the "Improved Automatic Universal Mallet Plugger" of Dr. Swartly, which is claimed to more efficiently supersede the mallet boy of "flesh and blood" than any other of the mallets.

The Backus motor for running dental engines has been improved, and is, in my opinion, the best assistant the dentist can have in his office. It is always ready, never weary, goes with the steady flow of the water, and is perfectly under the control of the operator. With it, the rubber dam and any of the dental engines the dentist may prefer, dentistry is made easy. It is our duty to ourselves, to our patients, to our families, to preserve our health and prolong our lives, and I am sure there is no one thing that will help the one and prolong the other so much as the Backus motor. With all these various appliances, we will grow young again in the practice of our profession, and will return from our vacations with overflowing delights to its welcome embrace.

DISCUSSIONS.

DR. TAFT: While I hail with pleasure everything enabling the dental operator to perform his work better than hitherto, yet I think we ought to be careful lest some of these things have an opposite tendency.

After hearing the report that has been submitted, one would think that all that is necessary is to have something to bore with. We should be careful lest we overdo in this matter, and attempt to do everything with the dental engine. I have seen some operators who thought they could do almost everything with the dental engine, and in many cases the teeth were ground, and drilled, and bored, and burred away far more than they ought to be, and with far less precision than ought to be exercised in an operation. Those who have been long in practice do not, perhaps, need a caution in this respect, but to young men such a caution is particularly applicable. They are liable, by the adoption of the engine, to fail in the attainment of that delicate and precise manipulation so necessary in making a thorough operation.

I think that while we are making appliances of all kinds to facilitate operations, we should try and make equal progress in our knowledge of the principles upon which such operations should be based. The elements of efficiency in a dental operator are not in the appliances he uses, but in his knowing how to do the work. Let us not run wild upon this subject of appliances, for there are things in dentistry of vastly greater importance, especially to the young men, than this branch of our specialty.

DR. ATKINSON: There is a department of operative dentistry that has not been touched at all, which I esteem one of the most important, and it is very opportune to refer to it now, after having heard the report on dental chemistry, and the manner of determin-

ing the operations of the change of current of galvanic action, whereby the filling of teeth is made a necessity. All that can be said in commendation of the restoration of the natural organ to complete contour by the substitution of some indestructible agent I heartily endorse. But there is behind all that a current of circulation which influences the nutrition of the teeth, which we ought to take into account.

Almost all teeth which are decayed enough to require filling at all, in some manner endanger the security of the vital action of the pulp. Many very fine restorations have been made over pulps that had only a thin stratum of dentine to protect them, which have finally died, the teeth became discolored, and the foundation laid for the necessity of this bleaching process. Something that shall be at least as poor a conductor of thermal and nutrient currents as is the dentine, ought to be substituted just as far as possible, and admit of a sufficient amount of restoring substance to complete the contour of the tooth. If a filling could be but a simple stratum of gold plate that should impinge upon the periphery of the cavity so as to exclude all chemical agencies, air, moisture, and electrical currents, I should say it was a perfect filling. I am using now oxy-chloride of zinc as a protection, and I find it very good.

Dr. Rehwinkel: Do you use the oxy-chloride of zinc in contact with the pulp tissue, or do you insulate it?

Dr. Atkinson: I prefer to insulate it, but in contact I get secondary insulation. I do not desire to put oxy-chloride of zinc in contact with the pulp tissue at all, for the reason that it has so strong an affinity for the albuminoid substances, but when this is saturated, that albumen becomes itself a protection to the substratum of the pulp tissue; but I would prefer to have the pulp covered by a normal covering—by the dentine. When not so covered, mix a solution of salicylic acid with the oxyd of zinc. This poured over the exposed pulp in a creamy condition enables it to take the form of the pulp, excluding air and moisture. Upon that apply the oxy-chloride of zinc, mixed stiff enough to afford a means of protection, and act as a non-conductor.

Dr. Abbott: There is one thing in connection with the use of dental engines which I think ought to be brought out clearly, and

forcibly insisted upon, and that is, that young men should not undertake the use of any engine, or any appliance for operating about the mouth, until they have first learned to manipulate with the utmost skill by hand. They should first be well grounded in all the principles of their art. They should study the anatomy of the teeth thoroughly; understand exactly the size of the pulp of the tooth, and its shape, so that they will know where and how much they can cut without exposing it.

In reference to this bleaching process, that brings us back to the subject of amalgam. I do not believe that amalgam, or any of its constituents, enter into the substance of a live tooth. I do not believe a live tooth is discolored by it. I believe it is the dead tooth. And what discolors it? It is not the amalgam; it is the decomposition of substances in the tubuli of the tooth.

In relation to the water motor spoken of, I know little about it. The only seemingly successful thing which I have seen for running an engine, is the electrical machine. There seems to be something about that which will answer the purpose.

In relation to the capping of the pulp spoken of by Dr. Atkinson, I have never used salicylic acid in that manner, mixing it with oxyd of zinc. In this connection I desire to ask Dr. Atkinson what he makes his paste of.

Dr. Atkinson: A solution of salicylic acid in alcohol or ether.

Dr. Abbott: I wished to find out whether there was anything put between the thing itself and the substance as laid over the pulp. I believe pulps may be preserved by many different things. I know they can by oxy-chloride of zinc, applied to the pulp itself, with no substance between, with the exception of the coagulated albumen produced by the application of creosote; but I hardly think oxy-chloride of zinc is a non-conductor, at least in my experience it has not proven so. I have seen many cases where the shock caused by thermal changes has been so severe that the pulps have died. I think a thin layer of Hill's stopping serves an excellent purpose in such cases, and I always use it where I have room.

There is another idea which occurs to me in this connection. In filling the canals of teeth where the pulp in the anterior root of a lower molar is inaccessible, and the buccal roots of an upper molar

so small as to make the introduction of an instrument impossible, the operator depends upon something to seal it up without removing the substance. In such cases he will do well to use a solution of gutta percha in chloroform. First having excavated the cavity as much as possible, he takes a piece of Hill's stopping and places it over the opening into the canal, which he has previously enlarged. He then lays over it a piece of this gutta percha, after warming it, and pushes on that, and it forces it into the very ends of the canals. That was practiced by gentlemen in New York several years ago, but I never saw any of the results of it until I saw them here in the hands of Dr. McKellops, of St. Louis, who has some very beautiful specimens. I hardly think it is practicable to fill all the canals of teeth. From what I know of a great many roots, I should not consider it safe to attempt enlargement. Many teeth are spoiled by an instrument being run through the side of a root before it comes to the point which it is intended to reach, on account of the tortuousness of the roots.

DR. MCKELLOPS: This matter of root filling came up in the Missouri State Dental Society last spring, and was then presented to the profession by Dr. Bowman, and after seeing it thoroughly tested, I went to work and prepared these specimens. The operation is simple; is done by a watch maker's broach, and the instrument does not have to go into the cavity itself. In all cavities where I cannot get in with gold, I use that. By an examination of these specimens you will perceive that they follow out the whole extent of the nerve canal.

A MEMBER: What becomes of the pulp?

DR. MCKELLOPS: You take that out.

A MEMBER: When you find the nerve canals so that you cannot introduce a broach, how do you satisfy yourself that the nerve is entirely gone?

DR. MCKELLOPS: I cannot tell. That is impossible; but I get into those roots and treat them with creosote, and thus remove any matter which may be there, as far as may be, forcing the creosote in the same way I do the gutta percha. The operation is quite a simple one. Take, for instance, the anterior root of a lower molar where the cavities are small. You first put on your dam nicely. As the chloroform evaporates it gets a little stiff and falls out; but

persevere with a fine instrument, and, the temper being taken out of the broach so that you can bend it in any direction, you will be enabled to get in a filling where you cannot see it.

A MEMBER: What is your mode of removing the pulp from these small tortuous canals?

DR. MCKELLOPS: I first take a fine broach, and then I take a little Sea Island cotton, which is very fine, the least fibre of which, wrapped on one of these fine broaches, and introduced into the canal and reversed, will generally bring out with it almost anything which may be there. If you barb an instrument you will be apt to break it, but with this little bit of cotton you can generally extract the pulp.

DR. REHWINKEL: The question in regard to the protection of roots is one that has been much disputed among us for years. I have had the temerity to differ with Dr. Atkinson upon that point. You have heard me ask him whether he brings the chloride of zinc into immediate contact with the pulp, and he admits that he does, and gives a reason therefor. Now, I cannot go into the whole question; it is a little too fine for me, but I will ask you one question: Do you believe it possible that a tissue as delicate as the dental pulp will tolerate an agent of the strength of which we have no precise knowledge, because we use the fluid in the condition in which it is furnished us by the manufacturer, but which is of sufficient strength to be employed almost everywhere else for the purpose of destroying tissue? If we wish to get rid of a tissue without using the knife, we use that very article to destroy it, and frequently in tissues on the external part of the body, much less sensitive than the tissue of the tooth, we find it exceedingly destructive. Dr. Atkinson is not alone in the advocacy of this process, but if any mischief has resulted from it, he is more responsible therefor than any other man, because his word is authority; and I say that more harm has resulted from the adoption of this remedy than from any other I know of. In rare instances, perhaps, the recuperative vigor of the tissue may be sufficient to resist its effects, but in the great majority of cases it is ruinous to it. A marked peculiarity of its action is that, instead of creating a rapid decomposition in the tissue, and thereby betraying clearly its destructiveness, it adopts the old Egyptian process, and mummifies the pulp—dries

it up, so that you can scarcely tell whether you have a live or dead tooth. You come to the conclusion that the pulp is alive, simply because the tooth has kept its color. It may even respond to the thermal changes of heat and cold, and yet it may be dead.

We ought also to be careful not to take all pulp exposures as alike. We ought to admit that there is a difference in the exposure itself, as well as the pulp, and those conditions ought to govern the choice of remedies. In a simple exposure by accident or awkward use of the excavator, must you go to work and bathe that pulp with carbolic acid or creosote? I think not. I believe there is furnished by the blood itself recuperative power in the pulp to heal up that wound, just as there is in every other part of the body. Simply take it out of the cold into the warmth, as Dr. Watt would say, cover it up with a non-irritant, for which purpose I don't know anything better than the agent employed by Dr. McKellops, a solution of gutta percha in chloroform. If you use oxy-chloride of zinc, I would, even in such cases, take a thin piece of paper, or like substance, spread it with a little balsam fir, and make a covering of that, before I would use the oxy-chloride of zinc; but if the pulp has been diseased long, and shows symptoms of irritation, it may be different.

In regard to the specimens presented by Dr. McKellops, I think that is one of the best things we have ever had. It confirms what a number of gentlemen have held and proclaimed; for until within a very short time it has been held that the only proper substance for root filling is gold. Gold is not, under all circumstances, the best material for filling, far less for filling the roots of teeth.

Dr. Atkinson: I desire to make a few remarks by way of correction of the last speaker. I have been held by that gentleman to be responsible more than any other man for the introduction of the use of oxy-chloride of zinc.

Dr. Rehwinkel: That method is known generally as Atkinson's method.

Dr. Atkinson: I only wish to announce that I am not responsible for men's understanding through their elbows—I am not responsible for their misunderstanding plainly stated truth. Go to the Cosmos, March 1868, and there you will find Atkinson's method

of treating exposed pulps, and the only difference between then and now is that I then used the creosote itself, instead of the active principle, salicylic acid. I said then, in an off-hand speech: "When your pulp is exposed and your cap prepared, make a little pool of creosote over the exposure. Then take the oxy-chloride of zinc, mixed into a creamy consistency, and drop on to the pool of creosote; tap lightly, and a wave of creosote will exude on the margins so as to completely bathe all the cut ends of the dentine as the oxy-chloride creeps out gradually to the margin. Then with a twisted bit of bibulous paper dry out the excess of creosote."

DR. REHWINKEL: The definition my learned friend has given does not cover the ground. I did not undertake to quote at all. I simply stated a thing which is an admitted fact. We all know that Dr. Atkinson indorses the use of oxy-chloride of zinc in immediate contact with the pulp.

DR. ATKINSON: You know nothing of the kind. What is immediate contact?

DR. REHWINKEL: Pray, Doctor, do not go into your metaphysical distinctions. Now, if I put my arm around your neck, thus, (doing so) that is what I mean by immediate contact.

DR. ATKINSON: Contact of the coat sleeve, not contact of Rehwinkel!

DR. REHWINKEL: Whether the creosote represents the coat sleeve or not, that does not make the thing any better, because the coat sleeve, in that case, is just as unfit to come in immediate contact with the pulp tissue as oxy-chloride of zinc. Now, Dr. Atkinson is a man who will present a thing most plausibly. If he does not convince you, he overwhelms you; there is nothing left of you. In misquoting I would be guilty of the meanest act. I merely stated what I understood to be his method, and asked him if he still practiced it.

DR. MORGAN: The gentleman seems to insist that in every case where oxy-chloride of zinc has been placed in contact with the living tissue of the pulp, destruction of that pulp has been the result. I know, however, that that is not so. I have been careful in removing oxy-chloride of zinc not to expose the pulp, but when I one so I have found the pulp still living.

With regard to the specimens we have before us, they are pretty, but I fear they are not practical. I am not satisfied to fill the pulp cavity with a plastic material, because I cannot tell what I am doing. I apprehend, in a large majority of cases, especially those where it is difficult to remove all the pulp, a portion of the canal will be filled with the *debris* of the dead pulp, and some fluid substance, and in filling, that you will necessarily push a portion of it through the foramen and soft parts. That is the difficulty with any plastic material. You will drive it through the foramen out into the soft parts. The gold itself may give rise to irritation under such circumstances, though in some cases it will be tolerated. Lead has been used for that purpose, and it has been claimed that the tissue will tolerate the presence of lead when it will not tolerate gold, or any other metal. In the use of oxy-chloride of zinc, I have seen more than one case where it has been driven through into the soft parts, and given such trouble as to make it necessary to remove the tooth. If it is a case where there has been an abscess, and there is an external fistula reaching to the point of the root, you can obviate the difficulty, but in the case of a healthy tooth it will give rise to irritation, and generally require further treatment.

Dr. Abbott: I coincide with Dr. Morgan entirely, relative to oxy-chloride of zinc. I know pulps are saved when oxy-chloride of zinc is placed in contact with them, except so far as that little pellicle of albumen, produced by the application of creosote, separates them. I know they are preserved for months and years. For a number of years I kept a record of every case, and watched it closely, and out of seventeen cases I had sixteen every time that were saved in that way. In one patient's mouth I had three teeth where I capped the pulps and filled with amalgam. At the end of two or three years the young lady concluded to have them refilled with gold. I removed the amalgam fillings and found that in every one of those teeth there was a formation of dentine to protect the pulp. The cap flew off and showed that the teeth were in a perfect condition, with the exception of a little minute place where the oxy-chloride of zinc had entered in and struck the pulp. I know those teeth were alive, because I cut around them and found them sensitive all over. I know, however

that it makes a great deal of difference how they are handled in the effort to preserve them. It must be done carefully and minutely, and in such a way that the pulp will not be irritated, and treated so that any inflammation will subside, and they can be handled as well as an incision in any other part of the body. But gutta percha will not preserve the pulps of teeth for me nearly as well as the oxy-chloride of zinc applied directly upon the pulp.

DR. REHWINKEL: I gave that as the simplest case of pulp exposure. I know perfectly well that there are cases where it becomes necessary to flood your pulp with creosote, but I do not think it necessary nor wise to flood the freshly exposed pulp with creosote. You may get a good deal of albumen, but you do not get what you want.

DR. ABBOTT: I get exactly what I want with creosote. With this coating of albumen I prevent any exudation of material through it into the cavity. This capping over the pulp retains the fluid there. If you put the cap on and leave an opening there, in a short time it will fill with fluid from the incision made in the pulp, and very soon produce irritation and destroy the pulp. This coating of coagulated albumen is just the substance we want, to prevent the thing. It will heal kindly under that.

DR. A. O. RAWLS: Before I proceed in the other branches of the subject, I wish to state to this Society the process which was given to the Kentucky State Dental Society, by Dr. Peabody, of Louisville. He once had occasion to fill a nerve canal, when he found that he had nothing to fill it up with temporarily, as he was accustomed to do, but a bit of lead. He therefore made a bit of lead wire and ran it down the nerve cavity, and left it for the time. It was a tooth which he had been working on for some weeks, where he seemed to be unsuccessful in getting it in a condition to bear stopping. He found, after this wire had been in a week, that the patient was not troubled by it. He let it go still longer, and found that no difficulty whatever arose from it.

This experiment was so successful that he continued it, and each case being attended with the same satisfactory results, he at length adopted the method in his practice. He uses nothing but lead; getting the shape of the canal as near as may be by means of cotton on a broach, he makes a lead wire as near that shape as possible,

and puts it down as far as possible, and leaves it there permanently. I am only giving you his method. I do not think it quite as good as Dr. McKellops', but the lead seems to produce some kind of therapeutic effect which nothing else has done, more particularly upon those teeth where there is a tendency to chronic inflammation, or a peculiar irritability of the parts, which will not bear the least pressure from any foreign substance.

Dr. Atkinson has advanced the theory of the application of the oxy-chloride of zinc in immediate contact with the pulp. This, I think, is correct practice as he uses it. It will not, of course, do in all cases, any more than certain strong remedies will do with the weakest and most susceptible patients under the influence of any other disease. I think with a few patients the oxy-chloride of zinc can be used in its pure state, and yet I think there should be the utmost care exercised in all cases. It is a question in my mind whether the application of carbolic acid or creosote, or any escharotic, to the nerve and dentine is advisable. In the first place, the action of the escharotic is to astringe or draw up the point of exposure in the centre, and project it through the opening. And then comes the question, is this carbolate of albumen soluble in contact with the live tissue of the teeth? Will it be taken up, or left *in situ?* Strangulation will often take place from a puffing up of the central part of the pulp in contact with the ragged edges of the exposure. Something should be used in these cases which will not be an irritant in any particular, nor an escharotic. We want, first, something to come down in contact with the pulp—a good non-conductor, which will resist the encroachments of the superadded material. If plaster of Paris had sufficient durability it would be better than oxy-chloride of zinc, or anything in which there exists an escharotic property. To make a direct application of the chloride of zinc to an exposed pulp, would be ridiculous, and success is also very doubtful where we use a large amount of material between the capping and the exposed portion of the pulp. The nearer we can bring this capping to the pulp without danger from its escharotic principle, the nearer we come to success.

I believe it exerts a rather beneficial influence where you allow it to touch the open tubules; in so far as it is antiseptic in its properties, it will exert a beneficial influence toward stopping the

further disintegration of that tissue. As has been mentioned heretofore in connection with the subject, a chemical decomposition takes place. Even though a filling be gold, there is a constant tendency to that, and anything that will protect these open tubuli will be a benefit, no matter what filling is put in. Now, I believe oxychloride of zinc will exert a good influence if you can carry it only so far as to protect the open tubules, and not allow it to come in such close proximity to the pulp as to cause death to that. I think Dr. Atkinson's treatment is nearly correct, but he does not define particularly the cases wherein this treatment will do, and where it will not. I think, also, that Dr. Rehwinkel's remarks were very much in place, inasmuch as they refer to a class of teeth whose structure is loose and open, wherein the chloride of zinc penetrates to a great depth. And these cases constitute the larger part of the cases in this direction. There are few cases coming to us for treatment, and especially those where the exposure is large, which will resist a sudden and complete application of chloride of zinc, even though you put carbolic acid or creosote in contact with the pulp first. I believe, in these cases, we can remedy the effect of the carbolic acid on the pulp by using salicylic acid instead, which is, as Dr. Atkinson said this morning, really the active principle of creosote. Use it in contact with the tissues of the mucous membrane in any form you choose, for instance, with glycerine, and apply it to the gums for a few seconds, and you will find there is a coagulation of albumen just the same as though you use the creosote itself. It is a non-irritant, and has also the same antiseptic properties as pure carbolic acid. If the capping is held off the nerve by any substance, or has any tendency to disintegration, you are not safe, for a slip of the instrument, or a little undue pressure on this or that part of the capping may cause a breaking away, and you cannot apply the capping material in sufficient quantity to overcome the power you have to use sometimes in putting in a gold filling. And in putting in amalgam fillings over these cappings, you will produce death of the pulp almost invariably, unless you allow that capping to completely crystallize and dry, so that there will be no chloride of zinc left in the capping to unite with the mercury. I believe the action of this is by the formation of either the bi-chloride of mercury or calomel, and I believe it penetrates through the capping

material often, and destroys the pulp. I believe oxy-chloride of zinc is valuable as a filling for the roots of teeth. Mixing it in a creamy consistency with fibers of cotton, it will penetrate all the fibers of the cotton so as to completely preserve it, and make it antiseptic in its properties. Working this down as near the apex as you can, it exerts an antiseptic influence upon the open tubules in the canal. Much depends upon a correct diagnosis of the case. I believe that in very many cases pulps of teeth are capped over when the operator has not the least idea in the world of the physiological condition of the tissue, and much less of its pathological condition. But it is a simple matter. We know that when a pulp is exposed it is in one of three conditions; determination of blood to the part, congestion and inflammation, or suppuration and death. Those cases where the inflammation has reached its height, just before passing into suppuration, are the most troublesome, but even such cases are generally amenable to treatment, and I think in very many cases the pulp is sacrificed when it should not be. I think sometimes you may cut down one-half the entire length of the nerve canal, and, leaving a shoulder, apply your capping, and have more chance for success than if the pulp had been exposed in a simple manner, from the fact that you have not the same trouble to contend with in the way of strangulation. The remainder of the pulp is confined in a perpendicular cylinder, and there is no chance of strangulation.

Dr. Butler: The report on Operative Dentistry is merely an essay upon machinery and appliances, and if we have got to that point where we must practice dentistry by machinery, we may as well be call machine men.

Patients, so far as my experience goes, are not fond of being made a machine-shop of. It is true that some of these various appliances enable us to work more rapidly, but it is very inadvisable for young operators to adopt them in all cases, for if they do they will never learn to cut upon living tissue as they should. It is claimed that a filling can be packed more rapidly, effectually and thoroughly by machinery than otherwise. I believe there have been more poor fillings put in within the last ten years by over packing than under packing. They have been packed to death. The gold has been packed not only so that it is not tight, but it has

been packed so much that the walls have been powdered, though, perhaps, imperceptibly. We have been talking of the chemical effect of metals upon the teeth. It is not chemistry at all. It is your miserable mechanics to a great extent. The excessively adhesive or hard gold requires a great amount of force to bring it down to anything like impinging upon the wall, and no tooth structure can resist the continuous concussion from the automatic mallet necessary to carry the gold down so that it will impinge upon the walls, without being powdered.

I say, therefore, that this machinery does damage even in the hands of the best of us. No man can regulate and apply the force as delicately and precisely with an automatic or electric mallet as he can with a hand mallet. In using the hand mallet he readily feels that peculiar rebound which indicates when he has gone far enough. I simply desire to call attention to the fact that we may be overdoing this thing.

There is another point to which I would refer. I cannot conceive that there is any advantage in using gold and tin mixed up indiscriminately and packed into the cavity. We claim that in order to get chemical action we must have two metals. Now, shall we mix them up in one cavity so that they will receive the action of the fluids of the mouth upon them indiscriminately, and say they are just as good as either tin or gold alone? I think not. If you cut so as to have a clean wall, no matter if the sutures be fine, you need have no fear about the filling standing well. If you examine carefully you will find that in these soft teeth the sulci are deep, and run out fine, and it requires care to stop all these crevices, but if they are cut out and well filled with tin, you will have a better filling than if gold and tin together were used.

Again, there has been a great deal said here about the exhaustion experienced by operators in performing their operations. As a rule, we have to spend too much time getting ready when a patient comes to us for treatment. If we were more careful to have things ready and prepared beforehand for operations, we should economize our strength a great deal.

Dr. Abbott: There are several things I desire to say. In the first place, I want to speak of this villainous subject of amalgam. There are amalgam fillings that do good service. In the hands of

a great many men I would rather they would use amalgam for me than gold. There are so many thousand men who cannot properly fill teeth with gold, that they had better use amalgam, or rather gutta percha, for that is the material that will do the best service. I do not advocate the use of amalgam, nor do I use it often. Once in a while, however, I find a tooth which is better saved by its use. For instance, where two-thirds of a molar tooth is gone, it is desirable to save it, and yet not subject myself to the fatigue of putting a gold filling there. And I believe, in such cases, I can do a better piece of work than I can with gold.

In relation to the idea of hard labor, of which there has been so much said, there is a good deal in it, but there is one practice with which I greatly disagree, and that is working and eating late at night.

I believe, with Dr. Butler, that it is hammering gold against the walls of a tooth that produces this chemical change. The attempt to condense hard gold against weak walls is what does it.

DR. FLAGG: Somehow or other it seems to me as if I have been, during this day, in a state of partial somnolency, gradually going into a continuation of those experiments in sleep which I have been carrying on for fifty years. I woke up and found somebody was talking as somebody did years ago, about running wires down tooth canals, and I dozed again and found somebody was talking about a time still further back when they had some other arrangement, and then I woke up thoroughly and found it was 1875, and that I was just exactly where I was twenty years ago. I heard one good friend talking about treating exposed pulps with oxy-chloride of zinc, bathing them in creosote, and saying he knew they were alive because he examined. One gentleman says it cannot be done successfully. My friend Rehwinkel says he cannot manipulate oxy-chloride successfully. And why? He has not the manipulative skill. I suppose he knows that as well as I do. But what can he do? He can work gutta percha. I say that takes skill. It is spoken of contemptuously, but there is not one man in a hundred who can work it skillfully. Do you suppose that a man who can work oxy-chloride of zinc and save pulps, can always work gutta percha and save them? No, sir. One man is skilled in work-

ing oxy-chloride of zinc over waves of creosote, and another in working gutta percha without any such waves.

Now, why does Dr. Atkinson use salicylic acid? The reason is merely because it is the latest and last suggestion in that way; the omega number three, and that omega will last with our good friend until omega number four is presented. I suppose I have made as many experiments in the direction of saving pulps as any other man. I have saved an everlasting lot of them, and an everlasting lot of them have died. I have saved them under plaster of Paris; and I have found that to be a very nice article indeed. I have saved them under a little piece of cotton dipped in carbolic acid, and sometimes in tannic acid. I have gone on *seriatim*, using every appliance and method that came to my knowledge. It has been my aim in writing upon this subject to note the various results which attend the application of a remedy to the varying conditions we find in the teeth.

It is very easy to say "I fill certain teeth with amalgam," and it is very easy to ask a definition of the cases, and quite hard to give it. In one of my articles, not long ago, after having explained exactly what kind of teeth I would so treat, I said: "These are the teeth in which gold fillings generally fail on the proximal surfaces in a few years." And here I take the whole profession by the beard. I do not say the operations of ordinary operators, but of such gentlemen as I see before me. And I say, without fear of contradiction, that such fillings will fail, notwithstanding they are put in as our good friends Butler or Abbott put them in.

Now, gentlemen, in this question of capping pulps, it seems to me that there is something more to the matter than what has been pointed out. You will be surprised, perhaps, to hear me say that I think the climatic conditions of the place in which the patient lives constitute an important element in the question of treatment; then the temperament of the individual, and lastly, the particular systemic condition of the patient just at the time of treatment. With a patient who, temperamentally, is disposed to recuperation; who is in fair physical condition, and living in a section of country where the atmosphere and surroundings are generally recuperative, in a majority of instances, by the use of either oxy-chloride of zinc or gutta percha, even with ordinary manipulation, you can save the

vitality of an exposed pulp. But if you have a patient in a low, retrograde condition of health, systemically weak, with a soft tooth structure predisposed to decay, and in a climate favoring those conditions, I do not think that oxy-chloride of zinc, with any amount or degree of delicate manipulation, is going to do much toward preserving that pulp. Now, we try, in Philadelphia, and we signally fail, and I confess, for myself, that I am unable to save sixteen out of every seventeen cases presented to me. I am almost afraid the order should be reversed. But I am in correspondence with gentlemen in different parts of the country, and besides I find from observation, that teeth which a certain treatment makes perfectly easy and comfortable in Boston and other places, when exposed to the climatic influences of Philadelphia, are often very troublesome. And in such cases I have had frequently to undo the work entirely, filling the tooth temporarily, and sending the patient away with a recommendation to some good operator of my acquaintance, with whom I communicate, stating the facts, and asking him, if he finds the teeth in good condition, if he will do me the favor to refill permanently, adapting his work to the patient's surroundings.

I don't believe in saving shells, but when tooth after tooth has been broken down, and the person has but one or two shells left to masticate with, certainly they are all the more valuable to him. And those are the teeth which I fill with amalgam. A lady was in my office a short time since, who came to me eighteen years ago with two wisdom teeth which she wanted extracted, so as to introduce a section piece. I told her I thought they could be saved a few years more. I made the attempt with amalgam, and those two teeth were as good last week as they were eighteen years ago.

And now, gentlemen, in regard to another subject. About eleven years ago, as near as I can remember, we began experimenting with creosote and oil of cloves. As year after year went by, in my experiments I systematically reduced the creosote, until about five years ago I found the creosote and carbolic acid had disappeared, and the cloves had the ascendency. Since that time I have been conducting a series of experiments with the oil of cloves. I bathe the bottom of my cavities, and my exposed pulps with it, and I

place my oxy-chloride of zinc over this wave of oil of cloves, and I find many of those teeth do well. A vastly larger portion are saved so than are saved under creosote. It is a soothing application. It is not an escharotic or irritant; it does not make a carbolate of albumen.

A MEMBER: Is it the light or heavy oil of cloves?

DR. FLAGG: I was not aware there were two kinds. I simply ask for oil of cloves, and with my natural instinct I always ask for the best. I think it must be the heaviest.

A MEMBER: The light oil of cloves is the best.

DR. FLAGG: Then it is the *light* oil of cloves. Gentlemen, let me ask you to try it. I want you to know it is a potent pain reliever. I want you to know that if a first-class insect of the stinging kind punctures you violently, which occasions excruciating pain, if you take a little of the *light* oil of cloves, and put it over that bite or sting, that the pain will be removed in the course of a few minutes, and if you make that application in the course of two or three minutes, two or three of them will be eminently curative, and you will say, "go away, wasp!"

REPORT OF THE COMMITTEE

ON

MECHANICAL DENTISTRY.

F. H. REHWINKEL, CHAIRMAN.

With a consciousness that a report upon the status and progress of the mechanical department of our profession will fail (owing to the absence of new and startling discoveries, either in methods or materials) to command general interest, your committee would hesitatingly offer a few thoughts upon the subject.

Judging from the manner in which the reports of former committees have been received by this and other Associations, and the apathy shown during discussions concerning matters relating to this branch, we are forced to the conclusion that mechanical dentistry has ceased to be popular with the profession; nay, more, that the existing union of the operative with the mechanical department is looked upon by a few of its members as a clog to the full development of either branch, and that, in the opinion of some, the separation of the two will be but a question of time.

Under these circumstances, your committee might have been considered excusable had it limited itself to simply recapitulating, in

substance and form, reports of former committees, merely adding such changes and improvements as have been developed during the past year in this department, abstaining from comments regarding its status and relation to operative dentistry, and its claim to full fellowship. A little more comprehensive, however, is the conception of this committee in regard to its duty in this connection. In looking for the causes which have led to the changed condition of things, the question presents itself, whether this stand-still, or rather retrograde movement, is not, in a great measure, due to the introduction of cheap bases for artificial dentures, together with the almost total displacement of platinum and gold, and the consequent want of demand for that higher grade of skill requisite in constructing plates of these metals? But is it right that mechanical dentistry should depend for a reputable existence solely upon such dentures as require the highest degree of skill—a degree attainable by but a comparatively small number? Another question, and a pertinent one, presents itself to all of us, individually and collectively: Have our societies and associations given to this branch the same fostering care and consideration which has been bestowed upon the operative or surgical departments? Have any well directed and persistent efforts been made to prevent its degenerating into a mere trade? As individuals, have we not each and all contributed towards making mechanical dentistry what it is to-day? Have we not looked upon this branch as a little less respectable than the operative department? Have we not hesitated to acknowledge ourselves mechanicians as well as surgeons? And are we not now a little too ready to abandon a field of labor honorable in itself, and offering ample scope for the display of the highest mechanical art and ingenuity—that branch of dentistry through which the most enviable reputations have been made? Are we not too willing to abandon a good half of our legitimate occupation to a class of men who would only be too well pleased with our withdrawal, and who would thank us for throwing aside this part of our profession, and yielding it exclusively to their control?

These thoughts and queries have forced themselves upon the notice of your committee. It is neither our intention or within our province to argue the points. The deplorable condition of mechanical dentistry, and the evident disgust with the present state of

affairs exhibited by many of the most honored members of our profession, justifies the supposition that, before a great while, the issue will be made on the question of a separation of the two departments, and perhaps this association will be called upon to give expression to its opinion on the subject. Whenever this crisis arrives, for a crisis it will be, it is to be earnestly hoped that a question of such exceeding importance will not be decided upon hastily, but will receive from our colleagues the most serious thought and consideration, and that they will carefully look upon it in its present bearings and ultimate consequences; considering not only how it will affect the standing and position of individuals, but also the dental profession as a whole; and not least, though last, the best good of the public generally.

With these preliminary remarks, your committee will proceed to say a few words upon artificial dentures, the materials from which, and the different methods by which they can best be constructed.

As the highest production of skill and art, a well and faultlessly made plate of porcelain stands pre-eminent. Here the maker becomes a sculptor; is untrammeled by the usual difficulties and obstacles constantly presenting themselves when using teeth of ordinary manufacture. If he is a true artist he is master of the situation, and can impart an individuality to his work otherwise scarcely possible. But the more than ordinary skill and experience requisite in the carving of the denture, together with the difficulty in calculating or making allowance for the uncertain shrinkage of these plates, (which shrinkage, unless accurately provided for, must destroy the close adaptation to the parts to be fitted) will necessarily limit its use to a few experts. Specialists can alone hope to become universally successful. Next, and really very near to the former, we rank continuous gum on platinum and iridium base; the difficulties attending the above mentioned method are considerably lessened in this, and it is therefore more practical, and also within reach of almost any one who is at all able to construct a metallic plate. Should he be unprovided with proper furnace facilities, he can certainly arrange the teeth on the plate, properly antagonize, invest and solder them, and then send them to some one who is prepared to apply and fuse the gum. The baking and fusing require much practice and experience, and can be better done by one

who uses the furnace daily. Those who have been in the habit of thus managing, acknowledge themselves much pleased with the results. There is, therefore, no reason why continuous gum work should not be much more extensively used than it is. Why do we not give to this beautiful result of skill and art our best efforts and support? Is it the fault of the people that there is so little demand for it? The answer is, decidedly, No. If a community demands rubber work exclusively, is it not because the people have been made to believe that a rubber plate is as good as a gold or platinum plate? "So much cheaper, lighter and more pleasant to wear," and, mark you, "all the style now." We all know that almost any respectable practitioner can have influence enough over his patients to introduce any kind of work, and that it depends almost entirely upon himself what kind of plates they wear. Had it not been for a few men who held on to this kind of work with unyielding tenacity, platinum plates, with continnous gum, would now be antique curiosities, admired as specimens of art of former days.

Every year we have in our midst a colleague whom we all feel proud to honor. To him—John Allen, of New York, (formerly of Cincinnati), and to W. M. Hunter, of the latter city, dentistry and the world are indebted for the practical method of producing this beautiful style of work. We name these two gentlemen as the joint originators of this mode, for it would be unjust to deny the claim of either.

Grant your committee indulgence for thus re-stating facts, well known in the history of continuous gum work, but it seems almost to belong to a time long past. Few of the young members of the profession are even aware of the existence of this style of work, much less understand the meed of praise due those who for this toiled intensely during a time extending over many months, and even years; hopes raised ending in bitter disappointments; sums of money expended in tireless experiments; until success finally attended their ceasless efforts, and the whole profession, from Maine to California, shouted *eureka!*

In those days our colleagues felt proud when they were able to exhibit a piece of continuous gum work of their own manufacture. This style of mounting artificial teeth your committee would most

respectfully submit as the most artistic, and the very best for general practical purposes.

A combination of gold and rubber, or celluloid, will next claim our attention for a brief space of time. This is an excellent method of mounting artificial teeth, combining the advantages belonging to gold and rubber work severally, and avoiding objectionable features of either. This process being well known to the profession, a minute description is deemed unnecessary. It was protected by a patent, of which the Pennsylvania "Association for the Protection of the Rights of Dentists" became the owner by purchase, in the name of its Secretary, Dr. C. J. Essig, of Philadelphia, by whom it was dedicated to the public by order of the Association, thus rendering it free to all.

Aluminum as a base for artificial teeth has not proved as useful as its advocates, and the profession at large, once hoped. It is used but by few, and no new developments or improvements in the method of working it have come to the knowledge of your committee.

Of cheap bases, cheoplasty, introduced by Dr. Alfred Blandy, in 1855, is the oldest. This, like all other alloys, fusing at a low temperature, and of which tin forms the principal part, has never obtained a universal popularity, and although it has from time to time been much improved by different experimenters, and plates have been made of it during the past ten years which have given much satisfaction, (especially lower ones, in cases in which the alveolar ridge was almost obliterated) it does not seem likely that it will become *the* substitute for rubber.

Of the different compounds which are offered to the profession for the manufacture of these plates, that of Dr. Geo. Watt, of Ohio, known as "Watt's metal," together with that of Dr. D. S. Talbot, of Indiana, called "Talbot's artificial platina," are best known to your committee, and are, in our opinion, the most valuable.

Talbot's method of constructing cast dental plates differs somewhat from that generally adopted, and while it is more laborious, in the end gives more satisfactory results; the metal remaining bright when worn, and having but little of the metallic taste.

The improvements in celluloid as an artificial base, during the past year, have been of great value, and it is with no little gratifi-

cation that your committee feels justified in stating definitely that this style of work has ceased to be an experiment, and has become an established fact of great importance in mechanical dentistry, and promising in the future, when further perfected, to entirely supersede all other cheap bases. Among its present advantages appear the beauty and elegance of the artificial dentures when completed; the close approximation to the natural color of the gums; the extreme lightness of the plate, and, what is of far greater importance, no injurious effects upon the soft tissues of the mouth from mercurial poisoning. This last alone gives it an immense advantage over vulcanite. There are also some points of importance to the mechanician which deserve mentioning. In cases of difficult and irregular antagonization with prominent gums and alveolus, plain teeth can be used, offering a great advantage over the otherwise excellent and valuable gum teeth in sections of two and three. Again, the process of moulding and hardening the plates occupies just thirty minutes, or thereabouts, a difference in time of five to one in favor of celluloid over vulcanite. The question of strength, although at this time somewhat mooted, presents nothing discouraging, but can only be definitely settled by time. So far, all reports seem favorable. Your committee has taken pains to gather information on this point. No complaints have come to our knowledge, nor have we learned of any failures. Are we not then justified in concluding that celluloid has proved satisfactory in this respect? In order to test celluloid as a suitable material for a dental plate, one member of this committee, more than three years since, constructed an upper plate of this material for his own mouth, and from that time has been constantly wearing it. Let it be borne in mind that this plate was made of some of the first material put into market, and which is acknowledged to be much inferior to the present improved production; also, that it was moulded and pressed in the old oil tank; that it was the first plate of this kind ever made by the wearer, and that, notwithstanding all these disadvantages, it has stood the test of time, comparing very favorably with vulcanite. Now, if a plate made of inferior material has remained serviceable for more than three years, it is safe and logical to conclude that celluloid in its present improved condition, together with the superior methods now employed in moulding the plates, will be as

strong and durable as rubber. It is subject to query, whether the strength of this latter material has not been always overrated. This question of strength is the only one in which a comparison between the two products is admissible; in every other respect celluloid is, in the opinion of your committee, far superior to vulcanite.

The old oil tank is rapidly being displaced by the steam apparatus, steam being the agent now mostly employed for softening and moulding the plates. Different machines for this process are now in the market. That of the Celluloid Company, furnished through Samuel S. White, is so simple and practical in its construction, so reliable and satisfactory in accomplishing its work, and yet withal so reasonable in price, that it justly deserves its popularity. The absence of a themometer with the boiler is a source of anxiety to the novice, and is objected to by some; this want ceases to be felt, however, after using it a few times. Confidence in the reliability and the correct workings of the agent employed, and the consciousness of being able to work and handle the machine easily, will be established, and the oil tank, themometer, etc., will be discarded without regret.

Another process of softening and pressing the plates into shape is found in the application of moist heat. Your committee knows, from good authority, that this method is very rapidly gaining favor. An oven, with dry heat, so arranged that the flask can be watched during the process of closing it, without taking it out, is now being constructed. It is claimed that this last named method is superior to those preceding it. Your committee has had no experience with this mode of moulding celluloid, but from little incidental discoveries made in connection with the working of this material, would incline to the opinion that it will not only prove practical, but that it may offer advantages hitherto unattained, especially in welding one piece to another, which is desirable in repairing broken plates. Efforts to accomplish this are constantly being made, experiments are unceasingly going on, and as celluloid is only in its infancy, it is not unreasonable to suppose that it will rapidly be brought to a state of still greater perfection.

D. M. Lamb, Esq., of London, Canada, has succeeded in obtaining a vulcanizable gum from the juice of milkweed, by a process pro-

tected by patent, bearing date February 9, 1875, and No. 159,687. The originator claims great advantages over the ordinary products of vulcanite or rubber, and states that it may be used either alone or in combination with the ordinary "caoutchouc." This committee has no practical knowledge of this new material as a base for dental plates, but from its character, together with the fact that it can be used in combination with rubber, would respectfully suggest that any one disposed to use it had better first satisfy himself that he does not run in danger of infringing the Cummings patent.

F. H. REHWINKEL, } *Committee.*
J. F. CANINE, }

DISCUSSIONS.

DR. STOCKTON: I am much gratified to note the credit which my friend Dr. Rehwinkel bestows upon continuous gum work, and I wish especially to call attention to the dental colleges which turn out young men entirely ignorant of this kind of work. I have had young men in my laboratory to assist me, and I have almost universally found them ignorant of this kind of work. It is, however, the very best work we can do.

The report spoke of gold in connection with rubber or celluloid. I think, however, that platinum and irdium make a stronger plate, and one which can be used much thinner than gold. I have lately been making work of that kind with celluloid, and I find it to act beautifully. I would say a word in reference to celluloid manipulation. I have a new apparatus made by Dr. Manning, of York, Pennsylvania; a kind of large oven; you can go away and leave it for quite a time with the heat under it, and come back and go to work. It makes a harder plate than any other process I have employed.

PROF. D. D. SMITH: There is very little stimulus in this audiance to speak on a subject like mechanical dentistry, a subject almost entirely ignored by such gentlemen as we see here. I had hoped when this subject came before the Association for discussion, that we might have a tolerably full attendance, and one representing largely the younger members of our profession. This subject appears to be kept entirely in the background, and yet there are patients upon whom we bestow the utmost care, whose teeth are crumbling away hopelessly, and the patient is at length thrown upon the hands of the mechanical dentist. And now, does it become us, as representatives of this profession, to think of such a thing as the separation of these two departments—the placing of mechanical dentistry in one category and operative dentistry in an other? During our day, at least, they are one and inseparable. And now, what is the result of our foremost dental practitioners thus ignoring this matter? I have here (exhibiting) a set of teeth which came into my hands, within the last six months, from one of the first operators in this country, who, if he did not do the mechanical manipulation, had it done under his care. And what is the result? This high representative of the dental profession in the way of operative dentistry, has violated every principle underlying mechanical dentistry. In the upper jaw we have, in the first place, a hole in the plate, which is made to meet one of the superior teeth, probably the wisdom tooth. After this plate had been worn about two years it fell into my hands, and what was the condition of it? That tooth, being loose, was thrown entirely out of line, and became a constant source of irritation to the gum. I lay this down as an invariable rule, that when we have a single tooth, remaining either in the upper or lower jaw, if that tooth has no antagonist, we must, in the preparation of that mouth for an artificial denture, extract it.

The next thing I would call attention to is the arrangement of the teeth upon the plate. Here is an arrangement which is a violation of nature's law completely. They are placed upon the arc of a circle such as is known as a horse-shoe shape. Now nature never places natural teeth in this way, and it is our duty to follow nature in the arrangement of an artificial denture. There are cer-

tain cases where they may be found in this way, but in general the dental arch, from the cuspid back to the wisdom tooth, or to the last molar, is a straight line on either side. And this is the order which we must observe in arranging teeth. In this way the lower teeth would be arranged so as to stand on the inside of the arc, and when pressure is brought to bear upon the teeth in the act of mastication, that pressure will be distributed equally on the arc of the circle entirely around, so that the plate will receive the pressure on one side as well as the other, no matter upon which side the force is applied. Now, in this set of teeth, made by one of the first men in the country, all the masticating teeth on the lower arch are thrown outside the line of bearing, and the result is, that when pressure is brought to bear upon these teeth the plate is tilted to one side.

Another point to which I would call attention is the articulation, the opposition of the superior and inferior arches. As they are brought together they are not at all like natural teeth. There are but two points at which these teeth touch, whereas the line of bearing or contact should extend from the molars on one side, to the anterior bicuspid.

I will now, by way of contrast, and illustration, present a set of teeth made by an equally eminent member of our profession, which shows the true method of arrangement. (Producing specimen) This artificial denture is arranged in the most perfect accord with the principles I have attempted to explain. A straight line from the cuspid on one side back to the molar teeth upon the same side, the six oral teeth describing the arc of a circle, and so arranged as to bring the points of bearing of the lower teeth within the circle, and distributing the pressure upon all parts of the inferior jaw.

The next point I would criticise in reference to this set is the material upon which the teeth are mounted. It is a material which is worked under a license from a company, and a set of teeth in this age of dentistry, made by a representative of the highest style of dentistry in the United States, and mounted upon such material, is certainly a subject of criticism. We read that when the children of Israel were passing through the wilderness to the Promised Land, they deserted the Lord, and also Moses, their leader, and that they made for themselves a golden calf, before which they

bowed down. And so we, as a profession, have departed from true methods, and have made for ourselves, not a beautiful golden image, but a great, ugly rubber calf, at whose shrine we have abased ourselves until the divinity of inspiration and improvement has well nigh departed from us as a profession. Many leave out of view the fitness or unfitness of the material, and take into account only the oppressions which the working of that material brings upon them. Let us throw this off, and look this material squarely in the face, and consider whether it is the indispensable thing the profession has learned to regard it. If it is, let us bow respectfully to this matter of law, but if it is not, let us throw it aside.

Dr. Stockton has spoken of the deplorable ignorance of the gentlemen graduating from our dental colleges, as regards continuous gum work. There is some occasion for this remark, but I would inform Dr. Stockton that the Philadelphia Dental College teaches the construction and importance of this style of work with greater emphasis than any other. It ignores almost entirely the construction of rubber work, pointing out its advantages, but more particularly its defects.

Dr. Abbott: Not only does the Philadelphia college recognize the importance of continuous gum work, but the New York College does also, and I presume every college recognizes it as the highest perfection of art in that direction.

Dr. Atkinson: The records of the clinical departments of our schools show more rubber than anything else, in every school I have known.

Dr. McQuillen: I presume the explanation of that is that you cannot compel the patients to take the continuous gum work.

Dr. Atkinson: The colleges can at least require that continuous gum work must be made by every student before he gets his certificate.

Prof. D. D. Smith: I would inform the gentlemen that it is required of the gentlemen of the Philadelphia school that they deposit some case on metal. We do not say that it shall be a piece of continuous gum work necessarily, but a piece of metal work must be presented to the professor of mechanical dentistry, and placed in the museum.

DR. BARRETT: Some reference has been made to the milk-weed rubber. Some kind of a base of this kind is required, I think, by the profession. That it should be universally employed I do not believe, and yet it may have its uses. As I had some connection with this discovery, and have been repeatedly applied to for information, it may not be improper for me to say a few words concerning it. I have no other connection with it than as a dentist—no pecuniary interest in it. I believe this material to be an original discovery. That such a gum existed in certain forms of the vegetable kingdom was known, but the process of extracting it was unknown until this discovery. It is obtained from *asclepias*, or milk-weed. The method is this: The common milk-weed is gathered and cured as you would cure hay. It is then cut up finely and fermented, just as you would make malt. It is fermented, and the gum rises on the surface. This is then dissolved in bi-sulphide of carbon. The bi-sulphide is then distilled, leaving the gum. No thorough analysis has been made to show what its constituents are. It is, however, different from the caoutchouc gum, more condensed, and I believe it is stronger. It is, in a measure, free from that peculiar inflammatory character which is inherent in caoutchouc gum. It was one of the conditions laid down, before I would consent to introduce it to any one, that no system of office license should be inaugurated, but that it should be sold by the pound, and the sale should carry with it the right to use it. I believe it to be a perfect substitute for the ordinary vulcanite work, not only in hard rubber, but in soft rubber.

Now, the status of the whole thing is this: A company was formed, and, instead of obtaining dividends, there has been a succession of assessments until a great many members of the company have become dissatisfied. About a ton of the gum is ready for market, but the inventor will not put it before the public until he is able to give the profession a guaranty that it shall not be subject to the claims of the Goodyear Vulcanite Co. But I believe, and I have the authority of eminent counsel whom I have consulted, for saying that it will not be subject to the claims of that company. It is a new discovery, and it cannot be covered by any previous patent.

REPORT OF THE COMMITTEE

ON

DENTAL EDUCATION.

By G. W. KEELY, Chairman.

The future of dental surgery depends, in a great measure, upon the efforts now being made for the elevation of our standard of professional education.

The dentist claims his legitimate position as a member of the medical profession, a claim which that profession, (with their characteristic conservatism), will acknowledge only upon evidence of the most thorough and scientific culture. Such recognition, though desirable, is by no means indispensable. The dentist has higher aims, and recognizes profounder obligations to his specialty than to any self-constituted guild or corporation. His specialty in medicine is one which demands a high tone of original manhood, a thorough discipline of his powers by general, literary and scientific culture, and, finally, a careful and elaborate preparation for the delicate and arduous responsibilities of his calling. It is true that many burning and shining lights in the dental profession did not enjoy the preliminary education which is now felt to be an essential to the high-

est professional excellence. By virtue of untiring effort and great natural ability, they have achieved eminence and success in spite of these deficiencies. Such are the men who, enlightened by experience, would have the future members of the profession enter upon its duties unburdened and untrammeled, and thoroughly furnished with all mental requisites for their work. Such are the men who are earnestly laboring for the advancement of dental science. The assumption of its responsibilities at the present day, without far better preparation than the older practitioners enjoyed, argues a failure to comprehend those obligations, or a criminal indifference to them.

The requirements of dental practice are constantly enlarging, and can be met only by a deeper and more intelligent study of fundamental principles, and a more perfect adaptation of them in practice. The truths of the profoundest science must be embodied in the most intelligent and elaborate processes of art. Hence, dental surgery, like every other profession, demands equal facility in abstract investigation and in concrete adaptation.

These seemingly diverse tendencies, (the ideal and practical), must be brought into harmonious combination if we would bring into the profession minds capable of achieving its highest beneficent results. In the discussions of a dental society these two tendencies of mind will find special admirers, each of whom, if not careful to control their previous impressions, will be apt to depreciate the characteristics which least impress their minds. This is one of the proofs of imperfect training which, unfortunately, mars the success of men of all professions. Some are disposed to lay too much stress upon profound scientific indoctrination, supposing that the practical elements of professional character will develop themselves, or, at least, require much less effort at culture; others overvalue practical skill at the expense of fundamental knowledge of principles. Both of these extreme tendencies are to be corrected, and a system of professional education inaugurated, which shall harmonize them in the highest results. Such are the views of the leading minds of the profession. Upon the general points to be attained by professional education there is a remarkable unanimity. But as to the methods of attaining these results there are various opinions,

and a distraction of councils which is not favorable to prompt and vigorous action.

How shall dental education be conducted to secure the essential points previously enumerated? How shall minds unfit for its reception be prevented from engaging in its preparation? How shall dental surgery be relieved from the dead weight which embarasses it in common with other learned professions? Shall civil authority be called upon to prescribe professional qualifications, and to repel, by penal enactments, the intrusion of unworthy practitioners, or shall the profession resolutely refuse to fellowship with any but the worthy and well qualified? What tests of ability, talent and character shall be prescribed? What literary and scientific culture shall be demanded as a preliminary to professional training? Again, dental surgery being but a specialty of medical practice, how shall the fundamental indoctrination in anatomy, physiology, pathology, chemistry, and all other branches of a thorough medical education, be secured? Shall the regular medical colleges recognize the specialty and adapt their tuition to its requirements? Or shall the dental college call to its aid the medical professor, and thus supply the lack of basic professional culture? Perhaps both these methods will be tried, and the most eligible one be selected, after the result of experiment. The policy of maintaining dental colleges proper will, of course, continue, and we will thus supervise the qualifications of future applicants.

A practical question of great importance rises just here: Shall the efforts to establish these schools be concentrated on a few of superior excellence, or shall they be frittered away in the vain attempt to keep alive a multitude of starvelings, that may bring disgrace upon the profession, and multiply the half-taught, eager aspirants after professional honors? We have before us the very instructive example of innumerable colleges and schools in our country for general and special education, very few of which have any but a local reputation. The wretched resources of these schools occasion a destructive competition, and consequently a cheapening of academic honors, which has rendered them, in many cases, almost worthless. Even professional schools, both of law and physic, are not ashamed to underbid each other by lowering their standards of

study. The result of this fatally unwise policy has been the overcrowding of professional occupations with incompetent men.

Let us learn an important lesson from this experience. Our branch of medical practice is comparatively small, and should be kept up to a high standard of special qualifications. To do this effectually we need but few schools, and they should be of the first order. Local interests have no right to be heard in this connection, for the vital and general interests of the profession are at stake. Let the number and location of our schools be regulated by considerations drawn from the necessities of the profession at large. Three first-class colleges are all that are needed at the present time. One east, one west and one south, and, when the proper time shall come, one on the Pacific coast. For this number of schools it would be comparatively easy to secure large establishments, and permanent endowments sufficient to attract the ablest and most scientific professors, and to secure them against the necessity of daily toil for a living. The most ample apparatus for instruction and experiment should be provided, and constantly renewed when required, together with large libraries of well selected books in all departments of literature and science, as also in dental surgery. Without such endowments and equipments no school of any character can enjoy permanent prosperity. If our profession could be induced to concentrate its force on a few colleges, it would be comparatively easy to secure all these advantages. If, however, the unwise policy of dividing our forces (which has crippled other institutions) be adopted, we may expect to see the same waste of effort, and after many years of severe struggle to sustain a large number of schools, one by one will succumb to the financial pressure, leaving debts and exasperated feelings behind them. The few that may survive will not be as healthy and vigorous as though they had been nourished by the undivided care of the whole profession from the beginning. From the American Dental Association (the most influential power in the profession) should emanate the efforts to inaugurate this plan of concentration.

VOLUNTEER ESSAY

ON

DENTAL EDUCATION.

"D. D. S."

By J. Foster Flagg.

It is with no ordinary feelings that I enter upon the discussion of the subject of dental education. I stand, as it were, spell-bound, as I look back upon the vista of almost thirty years of professional life.

I had thought, until recently, that the lot of dentistry had long since been chosen.

I had thought that the deep plowshares of the sturdy veterans of the Baltimore Dental College had turned the sod for the cultivation of a new profession.

I had thought that I was one of a great, *united* band of workers, whose hearts were in their hands; whose faces had never turned back; who counted toil as naught; who worked and thought and fought for dentistry.

So full was I of this, that the old-time settlement, by medicine, of the status of the dental art had come to be a *cherished* by-gone.

Cherished as the act by which we were indeed made free; cherished as the sting which goaded Harris, Haydn, and their compeers, to such herculean efforts as gave birth to that which seems to-day incredible; cherished as the source from whence, *unwittingly*, has sprung so much development that we are justly proud of it.

All this was less than forty years ago, and even now are present those who well remember *how* it was that dentistry was born and honored with a "title."

Long and earnest were the councils when this work was done; slowly, cautiously, was each step taken; anxiously, hopefully, was launched the ship upon the waters; and nobly has it floated onward in its course from then till now.

And has it stopped? Has progress ended? Has everything been done that can be done? That now we, ever and anon, are greeted with a cry for "help!" *For help from medicine!*

In what *would* medicine give help to dentistry? In what *does* medicine give help to dentistry? In what *could* medicine give help to dentistry? I do not ask these questions thoughtlessly, arrogantly, captiously; but thoughtfully, seriously, earnestly. Medicine may be the lion, and dentistry, yet, may be the mouse; but if I well remember, it was the mouse that helped the lion. I don't just now recall the help the lion gave the mouse.

For quite a time, in years gone by, the Æsculapians discussed the worth of dentistry, and then found "nothing in it."

Nothing to give it merit worth an education *at their hands;* nothing to give it status *worthy their consideration;* nothing to give it claim to *their association.*

And now, has all this changed? Have we, by what we've done, proved merit *worth a liberal education at their hands?* Have we, by forty years of labor, made a status *worthy their consideration?* Have we, by work, by study and success, at last established claims which warrant the conferring of that "*opportunity for broader base,*" which, having been accepted, shall entitle us to *their association?*

Away with this! It seems to me as more than foolish. It seems to me to taint of ignorance regarding that which we, of all men, should have knowledge of—the breadth and power of dentistry. Its breadth is such that no one *dentist* that I know hath arrived

to compass it; its almost inexhaustible power for doing good is hourly taxed and hourly *demonstrated.* No theoretic dosing, no compounding remedies for weeks and months to try first this, then that; but something done—a *something* drawn from resources so varied and diverse, that not to give it separate existence is but to stultify it.

I have no fear in the enunciation of these views; no fear that I shall be regarded as an opponent of *progress;* no fear that I shall be accused of narrowing education; no fear that I shall clog the cherished interests of dentistry; for, if my record in regard to these has not been made, I cannot now begin.

For thirty years I've watched the progress of my loved *profession.* For thirty years I've seen each year fresh proof of individuality. For all these years I've felt the *emulative* spirit, which has grown stronger and stronger in the heart of dentistry; full of a yearning for better things; full of an energy for higher works; full of a zeal for achievements which should rival those of other callings; but until now I've never heard that over all, beyond all, above all, was a great goal which could alone be reached by *loss of our identity!*

What argument is there in the *assertion* that dentists *must* be medically educated?

What truth or force is there in the *assertion* that this is a foregone conclusion?

What reasonable inference have we that this would even be *desirable*, not to say *markedly advantageous?*

Is it that our best practitioners are medically educated; and that they are our best practitioners *because* they are medically educated?

Is it that our worst practitioners are not medically educated; and that they are our poor apologies *because* they are not medically educated?

Is it not the fact, on the contrary, that many of the very brightest from our ranks are not otherwise than dentally educated? And is it not true that year after year witnesses constant accession to the number of those, who, medically educated, have felt most woefully the absence of that knowledge which alone they could rely upon?

I will not speak to you of the average medical practitioner. I esteem him as a man; I associate with him as a gentleman; I re-

spect his average attainments. Of him I will not ask, but I *will* ask of the erudite of medicine; I *will* ask who, of all their professional corps, which one, among the most distinguished of their teachers, could stand, with credit to himself and comfort to his patient, *five little minutes* at the dental chair?

And why is this—that I can ask, but none can answer?

It is because the two great branches of the healing art are medicine *and* dentistry. Medicine, first, oldest and grandest, if you please; dentistry, second, youngest and least, if you please; but none the less medicine *and* dentistry; distinct in their mixing as are *oil* and *water*, the emblematic fluids of the two professions!

Year after year the lines of demarkation have become the more apparent; methods, appliances and rules for practice which pertain to one, are unknown, unheard of, by the other; subjects may have a vital interest for the medical man and yet possess but slight importance for the dentist; while all-absorbing questions for the dentist have not that interest to the general practitioner which can secure for them even a passing glance.

It is *this* which has caused the drifting apart of the two professions. It is this which forms societies of dentists; this which gives rise to dental colleges—institutions which, with all their faults, I here assert, have done as much for dentistry as medical colleges have for medicine.

It is this which has called into being the very organization which I now address, an organization which lives only in the *representation* of dentistry, and which would die—*if it could be killed!*

It is this which has made our literature, both text-books and journals. What are they to general medicine? That they are valuable contributions to scientific information I think will not be denied; that they have been productive of an immensity in the direction of alleviation of human suffering cannot be gainsaid; and yet, what are they to general medicine? And, on the other hand, how the great volumes of medical lore have poured out, thick and fast, like volumes of smoke! And what are they to dentistry? If they but touch it, *even the best of them*, the teachings are the laughing-stock of our profession.

The medical press indulges at times in satirical criticism of such magazine articles as we ourselves are ashamed of; but I very much

doubt if they often experience, in the perusal of recognized dental literature, that pity and contempt with which we frequently view the accepted efforts of their very best men when they leave their legitimate sphere and enter upon our domain.

It is in the nature of things that this should be so. I do not believe even in co-partnership between medicine and dentistry, to say nothing of the patronizing adoption of the one by the other.

In a co-partnership, the union would be that of age with youth; it would be that of the established with the progressive; it would be that of the dictatorial with the defiant of control. It would be a *mixture*, and never a compound; a mixture well represented by a medico-dental faculty; a mixture which would indeed have to be well shaken when taken, in order that its components should appear as one united medicine.

Well do I remember, in the earlier days of my professional life, the universal tenor of the general practitioner toward the dentist in cases of "consultation." The whole bearing was that of conscious superiority. But of what did the superiority really consist? It was merely *superior ignorance;* as in the "consultation," if the patient had dental difficulty, the dentist knew something about it, while the general practitioner *knew nothing;* and if the patient had no dental complication, the dentist was aware of the fact, and the general practitioner *was not.*

Gradually all this has changed, at least with representative men; and now, from the real workers in the medical ranks, instead of consultations, or ridiculous demands, such as for devitalization of pulps in pulpless teeth, or the extraction of sound and eminently useful roots for the relief of ophthalmic irritation, we have requests for examinations and information as to whether or not there may exist any dental lesion.

This is as it should be; for, while I think we could not work as one, I nevertheless see no reason why we should not work harmoniously, and as we are working, *advantageously*, as *two; desiring no recognition* except just that to which each is entitled; desiring NO EQUALITY except that which springs from courteous intercourse and the mutual benefit we give our fellow-men; desiring no association, except as co-workers in the great cause of humanity, and

leaving to time and the efforts of each, the settlement of the "status" of the two professions.

It seems but proper that a few words should be given to the grounds upon which seem based the idea that dentistry is a specialty of medicine.

It is because a part of dentistry is devoted to the treatment of the diseases of the teeth; and because, in the prosecution of this specialty of our profession, the principles of practice are those which underlie general practice.

Equally with any other, I think, without arrogance, I may say that I should recognize this.

Having made this seemingly connecting link between medicine and dentistry my special study, and impressed, as I am, with the immense importance of its cultivation, I may be allowed to say how little, how very little, of the practice of dentistry is comprised in this.

A dentist may be, of all others, most capable in this direction. He may bring to bear upon it all the information gained from the most extended medical education. He may have all this increased and rendered useful by "*special*" dental lectures upon these subjects, and yet he may be so inferior a dentist as to be utterly unable to render all this erudition of much value to his patient, or, in much degree, creditable to himself.

A vast fund of information, experience, and practical dexterity, which can in no wise be regarded as in the least "special" to medicine, has to be drawn upon before the great good of a permanent benefit is bestowed.

Lectures upon these subjects are not called "special" operative dentistry, and "special" mechanical dentistry, because they are the embodiment of those attributes which give it the distinctive features of a "calling;" and if, in addition to these distinctive features, there have been adaptations from pathology, from chemistry, from metallurgy, mineralogy and physics, to such extent as to warrant the necessity for so liberal an education as to have invested the calling with a dignity derived from knowledge, *it is thus that we have made it* A PROFESSION.

This brings us, in conclusion, to the question of dental education. That the dental colleges, as now constituted, are all we need, no one

can for a moment think; but that any advance would be made by the engrafting of dental chairs upon medical colleges, I gravely doubt.

I do not doubt this theoretically, but from a practical knowledge of the working of the schools.

I know that the position of the dental element in such arrangement is subordinate.

What valid reason is there why dentistry should be subordinate to medicine, any more than that law or classics should be subordinate? And yet these have their distinct "degrees," though taught within the walls of one great university. It is *easy* to declare in favor of the abolishment of the degree of D. D. S., but it has been *hard* to gain for it that distinction which has already given it a recognized acceptation by the whole civilized world. What is the first practical gain in this direction? Is it so great a glory to *substitute* the D. M. D. for D. D. S.?

It is easy to say that one degree in medicine is enough, for no one will deny it; but to say that the "greater" *covers* the "lesser" is an assertion which, to say the least, is disrespectful to a degree which has earned for itself the right to be highly respected, and which is *not yet covered.*

With what arrogance has it been asserted that the degree of D. D. S. is one of partial culture! And with what sycophancy has it been intimated that the degree of M. D. is one of desirable fullness!

For me, if my degree only impresses me firmly, constantly, unwaveringly, that it *is* a badge of partial culture, and thus prevents the feeling that I am possessed of "desirable fullness," I shall never cease thanksgiving that I am a D. D. S.

Therefore, if dentistry is taught within the walls of any classical or medical university, its degree should either be M. D., with its desirable fullness, or else be D. D. S., with its respectable signification, and thus take rank with A. M., L. L. D., Ph. D., D. D., and other badges of partial culture.

But what of *our* work? As members of the profession of dentistry, it should be ours to rally in solid phalanx to the support of those means which have already done so much for us.

The sources from whence have flowed such streams cannot suddenly have dried; they must be nourished, cheered, and strengthened; not that they have not done well, but that they may do even better; not that their teachings have been lame and impotent, but that they may rival those of the best instructors in each and every department.

Our colleges, our journals, our associations, and our societies should each and all have our good words and deeds. Our intercourse should be characterized by urbanity, liberality, and, above all, *professional* courtesy. Our aim should be that individual *esprit de corps* which must result in never-ceasing progress.

We must try to cultivate unity of purpose. We must try to maintain ever in view the pathway we have thus far so prosperously trodden.

We must eschew all changes which offer us short roads to high positions, and rely unfalteringly upon the faith that *worth will win the day.*

DISCUSSIONS.

DR. SHEPARD: I feel somewhat diffident, after hearing the eloquent and impassioned essay of DR. Flagg in speaking upon this subject. I also dislike to enter into this discussion, because I happen to be, at present, unlike himself, somewhat interested in practical education in connection with our colleges. I would not have attempted a reply to any of his remarks if he had not so far departed from general statements as to attack, by name, the institution with which I have the honor to be connected. As he has done so, however, I feel it necessary to say a few words in reply. In the first place, I question the gentleman's assumption of his knowledge of the prac-

tical workings of all the colleges in this country, though he may be familiar with the workings of some of them. By his own expressions, he is manifestly ignorant of the practical workings of some of those institutions.

He says that whenever dental instructors are attached to medical universities there is subordination of the dental to the medical. This I deny. There is no more subordination of the dental to the medical in Harvard University then there is of the medical to the legal, of the legal to the theological, or of the theological to the scientific. A University is something different from an ordinary college. There is one governing board which governs all departments, and all those departments are equal. They may vary in importance, or in the estimation in which they are held by the community, but so far as the governing body is concerned, they are each equal and independent. There is no more connection between the dental school of Harvard University and the medical school of that institution then there is between the gentlemen who constitute the dental professors in a dental college and those gentlemen who occupy the chairs of anatomy in such colleges. It happens, in Philadelphia, that there are professors in the dental colleges who are also professors in some of the medical colleges. They occupy two positions; they are connected with the universities as medical instructors, and also teachers of medicine in the dental schools.

I see nothing improper in that. A man can as well lecture to one hundred as to five persons. It is simply an economy of force, furnishing to the dental student, at less expense, instruction which the dental profession are not able, or, at least, have not been willing in the past to furnish to their students. And it is to the disgrace of the dental profession that its colleges have not been endowed. Dental professors have given their labor gratuitously; furnishing their own apparatus and museum for illustrating their lectures. This has crippled our colleges, and it reacts upon us to our disgrace.

In regard to the glory of substituting D. M. D., I have not heard of any claim of that kind. With all the opprobrium that has been cast upon the change, there has never, so far as I know, been any attempt to explain it to the profession. The assumption of glory has been entirely by other parties than those who had been instrumental in bringing it about. I only know this, that the degree of

D. D. S. which I possess, and the only degree which I possess of a professional nature, is not to be found in the abbreviations of any lexicographer, although it is a degree which has been conferred for over thirty years. How frequently does it occur, also, that a dentist is asked the meaning of these initials? I say this not in any want of appreciation of its value, but it has not taken the rank it should have taken. The explanation is, that lexicographers derive their authority for their abbreviations largely from classical institutions, not from special schools.

The degree of D. D. S. has never been conferred by the Baltimore College of Dental Surgery. When the professors of Latin, in a classical university, are about to write a diploma, they must have it so written that it will stand the inspection of Oxford and Cambridge, and other classical institutions, and they found they could not confer the degree of D. D. S. They found they could not make it grammatically correct. As in theology, law, science, and everything else, things must meet the analysis of critical scholars, and the change was made for that purpose.

All we have done is to make a move in what we consider the direction of progress. We believe we are right, and we can see no reason why we should be arraigned as we have been, and accused of a clandestine and secret attempt to overthrow the system of dental education. I care not, however, for this, and I would not make these remarks, except that I thought there were some things which required explanation.

DR. MCQUILLEN: In the consideration of this subject, I would desire to rise superior to mere personal considerations; I would not stand here as the representative of any individual institution. I wish to be understood as standing here as the representative of education. It is true that I am identified with an institution, and that I desire to see it succeed, but above all I wish to see my profession elevated, and I wish to see the best means of education that can be brought to bear to bring about that result.

As most of you know, I am an evolutionist. I believe in the gradual development of species, and what is true of species I believe to be true of individuals, and also societies and institutions. Let us briefly review the history of our profession. But a few years ago, forty at the most, there were not more than three hundred

men engaged in the practice of dentistry, and some of these were men who had been failures in other occupations, and took up dentistry as an easy means of gaining a living. The artisan came from his trade, the blacksmith from his anvil, the carpenter from his jack-plane and saw, and with little or no preparation, entered upon practice. They regarded dentistry as a mere handicraft, and followed it as such. There were, however, a few men engaged in it who had studied medicine, and had graduated with honor. They thought here was a field in which they might render service. They had a certain amount of natural dexterity, and they passed through a limited amount of training to fit themselves for their calling. These men, desirous of seeing their occupation elevated to the dignity of a profession, conceived the idea of making appeals to medical colleges for the establishment of departments of dentistry, and making those appeals, they were rejected. The cold shoulder being shown, there was but one course to adopt, and that was the establishment of an institution where they should receive education, even though it be but a partial culture. Under such circumstances they established a dental college, which met with a limited support, struggling for years with pecuniary difficulties. It eventually succeeded, however, and the Baltimore College became at length an honored and flourishing institution. This institution sent delegates to the American Medical Association. As a student of medicine, I was present when the American Association met in the city of Philadelphia. Application was made through these delegates for admission to the American Medical Association, and again they were repulsed.*

Thus, the door being closed by means of which an education was to be obtained, what was to be done? Was dentistry to fall back into the condition of a handicraft? Were its followers to be denied opportunities of an education?

Under such circumstances institutions arose in different parts of the country. And now we hear criticisms with regard to the defects of the system of instruction pursued in those institutions, and we are informed that it would be to the advantage of our profession

*[The speaker, in support of his statements, then read from the transactions of the American Medical Association for 1852, a resolution which refused admittance to the delegates from the Baltimore Dental College.]

if we could have dental departments established in connection with medical schools. If a better course of instruction can be thus obtained, I, for one, am not opposed to it. But is it best for our profession? We do not institute a course by which the student has to attend a certain number of years upon lectures, but he has no opportunity of at once putting in practice his knowledge. Every operation is done for the medical student in clinics. He is thoroughly educated theoretically, and that is all. He goes out from the college to learn the art of medicine, and woe to the community where the tyro has to practice. In the dental colleges, if the curriculum is limited, it is yet thorough.

We are subjected to criticism. We live in an age of unrest. Everything is being criticised, and out of this criticism will come a great deal of good. But if there is anything for which I have a hearty contempt it is a supercilious and ungenerous criticism—Iago criticism, innuendoes. As a nation we have been criticised. Trollope, Maryatt, and, I am sorry to say, even Dickens, have subjected us to sneering criticism. Received with the generous hospitality which only Americans know how to exercise, they went home to ridicule our institutions, and to direct attention to our miserable efforts at self-government, not recognizing our youth and the rude developments incident to it. How was it possible to find in such a country maturity of development in art, and magnificent edifices devoted to learning?

But since those criticisms were written, how marked the improvement! What was a wilderness is now a smiling and cultivated country. Magnificent cities have sprung up, rivalling in wealth and magnificence the cities of the old world. If, then, we were thus criticised in our infancy as a nation, is it surprising that our profession should not escape?

If the dental colleges are not what they ought to be, sweep them out of existence. If they fail to properly prepare the student for practice, then close them up. The all-important question is, not whether the student receives an education which will entitle him to recognition on the part of medical men, but whether he is properly fitted to go forth and serve the community as a practitioner of dentistry. If dental colleges do this, and I believe they do, they should be encouraged and supported. The best evidence of

the value of dental colleges is to be found in the leading position of their graduates at home and abroad.

We hear a great deal said about a recognition of us on the part of the medical profession. The question always arises in my mind when I hear a man making complaints of that kind: Is not the fault with the individual? A high-toned, honorable man, I care not what his profession or walk in life, is always welcomed in the best society. If he has not the culture and refinement which society demands, society, in every sense of the word a sensitive plant, closes its leaves and quietly lets him alone.

DR. ATKINSON: Our object, as members of the dental profession, is to see that that profession shall be properly educated. We must begin at the bottom. When we sow seed we do not look for blossom and fruit in the first stage of growth. We expect a low development. It is for us, by activity and research under the law of progress, to grow into higher and better methods. Foundation principles we must have. It is a mere matter of how we shall utilize the means at our command, and not continue to hug methods which have become useless and effete.

DR. ABBOTT: I have but a few words to say. As every one knows, I am associated with a dental school, with which I have been for the last nine years connected. The institution I represent has been doing its work honestly and candidly. It has been, I believe, doing as good work as any dental school, whether independent or connected with a University. Not only that, but I think there are some things in which we have led them a little in point of requisites for our students. I rose more particularly to defend dental schools throughout the country—independent dental schools, disconnected with any University.

REPORT OF THE COMMITTEE

ON

DENTAL LITERATURE.

By I. Knapp, Chairman.

Literature, in its broader signification, is the recorded expression of all attainments in every field of thought and research.

Dental Literature is creditable to a profession that, scarcely a third of a century ago, began to study the scientific principles which underlie what was at that time a purely mechanical art. Before that date, and for some years later, a single volume was sufficient to fully describe and illustrate the physical appearances of the teeth, the cases, experiences, manipulations and appliances then known to the profession.

Apparently influenced by the example of the earlier authors, some later writers have attempted to compress into a volume the literature of the profession. The result can hardly be regarded as satisfactory.

The field of observation and research is constantly widening. Pathology and surgery demand an intimate knowledge of the histology of the teeth and surrounding tissues. The many morbid

changes of the tooth pulp often cause serious maladies in contiguous tissues, not unfrequently wide-spread in their influence. Nutrition, from the earliest inception of fœtal life to the full development of the permanent teeth, and dentition, with the serious disorders so common to that impressable period of life, demand extended and careful research and thorough study. Scrofula, syphillis, struma, inherited tendencies, malaria, anæmia, and many other systemic conditions, must often be fully understood before the dentist can decide intelligently how and when to act.

Your committee is of the opinion that the time has come for the full and exhaustive discussion of many subjects from a purely dental aspect, which are now epitomized, and occupy but a minor space in our literature.

Since the last report of your committee, a work on Dental Pathology and Surgery, by Dr. J. A. Salter, Surgeon-Dentist, Guy's Hospital, London, has been published. The volume contains about four hundred pages. It is divided into twenty-eight chapters, with descriptive headings, and has also, a full index. This arrangement makes it a very convenient work of reference. It is copiously illustrated.

Dr. Salter says in his preface: "Having practiced surgery in its general and broader aspect both in private and with hospital appointments, I was * * impressed by the too narrow and circumscribed view of the literature of the specialty I had adopted. It appeared * * that eminent hospital surgeons were scarcely aware how serious are some of the maladies directly dependent on tooth disease, and how largely the pathology of the teeth is associated with morbid changes in contiguous structures."

"Warty teeth had been mistaken for exostosis of the jaw; dentigerous cysts had scarcely been recognized. * * Alveolar abscess, dependent upon a carious tooth, was attributed to necrosed bone."

"On the other hand, dentists had but an imperfect knowledge of the pathology of the teeth, the morbid changes of the pulp, and a series of hard tumors, now classed as odontomes. * * * It appeared that there was a considerable field of surgery and pathology which was open to further research, and which would amply repay the labor of investigation. * * The immense population tribu-

tary to Guy's Hospital, gave me a rich reward in cases and pathological specimens. * * * The record of these, and those furnished by private practice, have been published during the last twenty-three years." It is well to bear this in mind, as Dr. Salter's frequent claim of being "the first to discover," "the first to describe," etc., might otherwise seem unwarranted. The present volume is a digested collection of these papers, with some additional chapters.

Your committee quotes one other remark from this preface, because it is thought the author's example is worthy of imitation: "It would have been easy to have treated other subjects which properly belong to dental surgery, by compilations, but it has been my desire, as far as possible, to express views and record observations only when I could do so as the result of independent thought and investigation."

Dr. Salter's style is simple, clear and vigorous. There is an evident easy familiarity with technical and scientific terms, but they are used sparingly, and only when definiteness of expression requires it. His descriptive powers are good. You rarely mistake or misapprehend him, for he never burdens his text with unimportant details, but seizing the salient points of the subject with well chosen words, gives sharp cut pictures, which hardly need his diagrams for full apprehension. If he lacks the flowing freedom of Tomes, his style is free from the latter's prolix elaboration of details, and he seldom indulges in hypothetical reasoning, which occupies so many pages of Tomes' work.

Dr. Salter has strong and decided convictions, and the tendency of his mind is to positive assertion of his opinions, especially in the discussion of controverted questions. But generally he preserves a philosophic tone, stating conclusions with judicial candor, and he often leaves important theories with a simple suggestion or question as to their verity.

His work is not a *system* of dental pathology and surgery, but rather a record of cases and observations, arranged in logical or natural order, accompanied by histological and pathological explanations, theories and suggestions. Hence, its merits, as a whole, can hardly be estimated by comparison. Neither is it easy, in the limited space of this report, to make a digest or an analysis that would con-

vey any comprehensive idea of the work. Your committee must be content to call your attention to a few passages which illustrate our author's habit of thought and modes of investigation, and from which you may receive some impression of the general character of his work.

From his chapter on the general anatomy of the teeth, we give, in condensed form, his views of the development and histology of dentine.

He says: "The dentinal tubes have extremely thin walls * * which are scarcely visible in the hard tissue, when seen in profile. * * * In transverse section the broad brilliant ring of considerable thickness, as viewed under high powers of the microscope, is an optical illusion. * * Upon the formative pulp is arranged a series of columnnar cells, constituting the *membrana eboris*, from the distal extremities of which minute tubular threads project, and as the dentine forms from without inwards, these are prolonged centripetally, a homogeneous blastema separating them, and being calcified with them. * * No other elements hitherto discovered enter into the formation of dentine. * * The supposed 'fibrils of soft tissue' in the dentinal tubes * * are the decalcified tubes themselves. * * * The minute tubules may be demonstrated just as well from the oldest as from a fresh specimen. * * The cylindrical processes appearing to project from the tubes, as described by Neuman, Boll, and others, are minute branches of the tubes, as I have myself seen; and further, the viscid contents of the tubules, after induration by chromic acid, (as employed by Boll) might readily be mistaken for fibrils. * * According to Boll, large numbers of very minute fibrils proceed outwards, passing between the ivory cells and their tubular prolongations. * * * It is probable that these are the nervous elements distributed to the dentine; but whether they pass into the intertubular substance, or, fastening upon the tube walls, are so piloted into the ivory structure, is quite uncertain. * * * It is, however, highly improbable that they pierce the walls of the ivory cells and occupy the axis of the tube."

For the observations and arguments adduced in support of these views, so decidedly pronounced, reference must be had to the text of the author.

Dentine consists of tubes and intertubular substance; beyond this, its histology, the elements that enter into its formation, and its mode of development, do not seem to be very satisfactorily made out, no two writers agreeing fully upon any one fact. Tomes finds "fibrils of soft tissue" in the tubes. He is in doubt whether they are hollow or solid. But he is exceedingly reticent in regard to the elements that enter into their formation, and their mode of development. He rejects Kölliker's views of the histology of dentine. After expressing some opinions upon certain appearances of dentine, he concludes: "That there is much to be learned upon the subject of the development of osseous tissues before our knowledge can be regarded as satisfactory."

Wedl accepts the theory of fibrils of soft tissue in the dentinal tubes, but thinks the "fibers have a corticle more dense, and a central vitreous substance." He rejects Neuman's sheaths. He says: "Dentine is developed by the calcification of the contents of the dentinal cells; * * their principal and accessory processes remain attached, and are transformed into dentinal fibers." This statement does not seem to have been well considered.

Waldeyer (Stricker, 324) accepts Neuman's sheaths, but does not believe they are calcified. It is his opinion that "the fibers are really completely solid. The dentinal fibers are enormously elongated processes of the so-called dentinal cells, or cells of the dentinal pulp (odontoblasts.)"

In careful observation of dentine in a state of development, it will be seen that a subgranular homogeneous mass occupies the uncalcified territory, separating the dentine from the cells, but the bodies of the cells are not embraced in it. The processes of the columnar cells pass through this mass, up to and in line with the dentinal canals. So constant is this relation of parts that the conclusion seems unavoidable that the cells do not receive the lime salts, but constitute the formative organ of dentine. It is equally evident that the processes occupy an important relation to the development of the dentinal canals. Being calcified together with the intertubular mass, they constitute the tubes themselves, or, as soft fibers, act as cylinders, around which the intertubular mass calcifies. The weight of opinion among recent writers is in favor of the latter theory. But Wedl's opinion is based upon what seems to be an

impossible theory of development. Waldeyer says the soft fibers can be seen in the canals; but the tube contents, when so seen, especially when stained with carmine, appear of very much less diameter than the processes present before entering the dentine. Other observations and collateral facts, which cannot now be considered, strongly favor Dr. Salter's theory of the development and histology of dentine.

Dr. Salter has an interesting chapter on secondary dentine, which he nominates osteo-dentine, dentine excrescence, and dentine of repair. In the following quotation he gives a clear, general description of the three forms of secondary dentine, and their relations to each other, and to the tissues involved:

"Osteo-dentine and dentine excrescence are not unfrequently seen in teeth that are worn and exhibit dentine of repair. Dentine of repair, however, always forms upon that portion of the pulp cavity next to the lesion, and is adherent, and in direct structural continuity with the primary dentine; whereas, osteo-dentine and dentine excrescence occur almost always toward the extremity of the fang, and the former is quite frequently detached from the remainder of the dentine. Moreover, in dentine of repair the pulp is detached and can easily be removed, whereas, in osteo-dentine it is bodily involved in the new tissue."

Again: "Secondary dentine is abundantly supplied with tubes, but they are generally obliterated by secondary deposit. It (secondary dentine) is not the result of the wear of enamel, nor of age, *per se*, but of lesion of the dentine of the primary system, which may occur at any age." "The dentine is a living tissue," he goes on to say, "capable of receiving impressions and of propagating them to a proximate organ, which legitimately has the power and the office of restoring it and repairing the lesions it has suffered. Such a view is quite in keeping with what we see elsewhere; it is not the tissue itself that is its own means of repair, but its formative organ. But in this case, how perfect is the repair, and with what clearness is carried out the idea of a *vis medicatrix naturæ*."

It is difficult to understand how Dr. Salter, after this clear and systematic statement of these pathological causes and physiological results, should fail to perceive that the elements for the formation of dentine of repair, or, at least, of amorphous calcific deposit, still

exist after the exposure of the pulp. He admits the possibility that the pulp may "resume a dentine development." He says: "When the fracture of a fang occurs I believe the pulp cavity is always opened, but at the same time the pulp is not exposed to external influences. Circumstances are present, therefore, for union of the parts, and, under these circumstances, union does really occur sometimes."

Speaking of the calcification of the pulp, he says: "The process has a close analogy to those many conditions in which irritation and increased vascularity, caused by disease in contiguous structures, issue in the deposition of adventitious matter; in this instance, as usually happens, the nature of the adventitious matter is determined by the normal nutritional affinities of the organ affected."

Dr. Salter says, in another connection: "The developmental cell is persistent, * * and remains through life, * * ever ready to resume a continued growth by centripetal elongation when the outer surface of the dentine is injured, producing 'dentine of repair.'" If these views are correct, and your committee believe they are, we have a sound philosophical and physiological basis for the conservative treatment of exposed pulps. The function of the pulp is to build up and preserve the dentine as essential to its own existence. To suppose this function to cease at the moment of exposure is not reasonable. Exposure increases the vascularity of the pulp, and excites the function of repair to a high state of activity. If properly protected, the orifice of exposure is speedily filled by a soft matrix, which soon hardens, by deposition of lime salts, into a firm, bony tissue. Thus we have another and fuller illustration of the idea of a *vis medicatrix naturæ*, so happily described in the text of our author.

The following quotation will illustrate Dr. Salter's careful habits of observation, and the tendency of his mind to draw general deductions from the facts observed. Speaking of sloughing pulps, he says: "The deep red band which I have described is occasioned by the dilatations of the vessels into ampullæ filled with clots. They form the limit of the circulation, and the dilatations are doubtless produced by the lost vitality of the vessels upon the margins of the slough; the vital contractility has ceased and the force of the blood currents dilates the thin walls, which passively yield, and the blood

coagulates. Probably the same change occurs at all sloughing surfaces, but the minute size of the tooth pulp, and the ease with which it can be isolated and examined with the morbid parts in undisturbed relation, afford exceptional opportunities for making the observation."

I refer to one other topic, because I do not recollect ever having seen it alluded to in any other text-book on dental surgery, i. e.: crushing the inferior maxillary nerve in extracting the inferior *dens sapientiæ*. Dr. Salter gives this graphic description of his first case: "It (the tooth) had barely passed the patient's mouth, when he sprang from the chair and, placing both his hands upon the right side of his mouth and chin, exclaimed, in the wildest excitement, 'What have you done? What *have* you done? You have torn away my lip! My lip is gone!' All the teeth of the lower jaw on the right side, were dead to sensation, and the area of the lip and chin supplied by the mental nerve was absolutely numb."

A case almost identical with this described by Dr. Salter, came under my observation about four months ago. I had not, at the time, seen these cases recorded by Dr. Salter. A Mrs. E—— came to consult me about a numbness and loss of sensation of the lip and teeth upon the right side of the lower jaw. She had had the inferior wisdom tooth extracted upon that side a few days before. I judge the operation was awkwardly performed, as the forceps struck the canine tooth, the first remaining upon that side, with considerable force. Mrs. E—— attributed her trouble to the violence of the blow. The parts had not healed. I passed a probe to the bottom of the socket and touching some soft body, a slight sensation of numbness was felt in the lip and tooth. The case was clear. The inferior dental nerve was crushed. Upon the fact that the nerve responded feebly under pressure, I predicted a restoration of sensation. But so far, my anticipations have been only partially realized. Mrs. E—— describes the shock of numbness as being so great as to instantly obliterate all consciousness of the pain of extraction. I noticed one peculiarity about the tooth, not mentioned in any of Dr. Salter's cases. Running across the lingual surface of the fang, about a line from its apex, was a groove of such dimensions as to suggest the idea that it might have formed a segment of the inferior dental canal. Indeed, it would be difficult to account for it on any

other supposition. If this hypothesis is correct, the accident was unavoidable in this case.

Dr. Salter's pages are replete with cases of the different forms of tooth disease and the diseases of contiguous tissues, influenced by, or the result of diseased teeth. The more obscure affections of the nerves, reflex, secondary and remote, dependent upon tooth disease, have received careful consideration and illustration. The effects of eruptive fevers, syphillis, phosphoric poison, and enfeebled nutrition incident to a crowded and poorly fed population, upon the teeth and surrounding tissues, are carefully described. Comments, theories and suggestions upon the histology, functions and pathological changes of the tissues and organs under consideration, run through the work. These are generally sound, and often suggestive of broader signification and wider application.

Dr. Salter does not allow himself to be drawn into the discussion of subjects which do not immediately pertain to dental pathology and surgery. He says very little upon the subject of dentistry proper, and that little of no value in the ordinary routine of office duties. He evidently loves his work. Writing mainly from personal observations, he presents many subjects from new points of view, often lending freshness to familiar topics. His full, clear descriptions make his work a valuable text-book for students, while the more advanced can hardly fail to read it with pleasure and profit.

The duty of preparing a report upon periodical literature, and a report upon the transactions of various societies, was assigned to other members of your committee. This division of work was understood to be satisfactory, but so far as advised, there will be no report upon these subjects.

Unsatisfactory health and the daily duties of the office will prevent more than a passing notice of our periodical literature. The desire of manufacturers to give wide circulation to the journals under their control, induces them to offer ready facilities for the publication of everything new or valuable to the profession. It is probably unavoidable that a large mass of crude, undigested, and often irrelevant matter should, also, find its way into these journals. The editors, who are actively engaged in other duties, and receive but a limited compensation for editorial work, can hardly be expected to reject

articles of little merit, needed to make up the number, to remodel communications or prepare much original matter. Sufficient attention ought to be given to editorial work, however, to prevent serious misrepresentation of a writer's or speaker's opinions. Fault is found, and justly, too, it is feared, that this is sometimes neglected, or very imperfectly performed. Still, these journals, with some acknowledged imperfections, have done a great and good work, second, probably, to no other one agency in assisting the rapid advancement which dentistry has made during the past few years. But there is room for improvement in all our agencies for educating the profession up to a higher standard of excellence.

A quarterly journal, edited by a good writer of varied and profound learning, giving his whole time to the work, aided, if need be, by paid articles, would, it is thought, be a long step in the right direction. It need not interfere with our monthly journals. They could be left to do their local work. But it could gather up and systematize scattered truths that are now floating away on our transient literature. It would become a desirable medium through which our best minds could communicate their best work to the profession. Its influence would be national, and commensurate with the ability with which it was conducted.

VOLUNTEER PAPER

ON

OPERATIVE DENTISTRY

(REPLANTATION OF TEETH.)

By W. N. Morrison.

The object of this paper is to submit a few ideas that will be of every-day practical value in every dental office in the country.

In Vol. VI, page 475, of the *Missouri Journal*, I reported two cases of replanting of teeth with the hope that other members of the profession would experiment and report cases; but, up to the present time, not more than half a dozen have been heard from, and only in an indirect way. The two cases reported were perfectly successful, and are doing good service to-day. Since then I have had occasion to resort to this practice several times. One of the cases was the first right lower molar in the mouth of a lady about forty years of age, of very delicate constitution and anæmic habit. The condition of the gums about the roots of the teeth was bad. They had receded, and a thin brown scale of tartar was quite abundant beneath, notwithstanding the patient's good care of her teeth.

This tooth had a large decay in the distal surface, exposing the pulp, and had been kept filled with oxy-chloride of zinc for a year or more. When the case came under my care there was another decay on the root below the oxy-chloride filling; the pulp in the posterior root was dead, but that in the anterior root and part of the body of the pulp were alive. The patient and her husband were anxious to save the tooth, but the operation was too exhausting for her to bear. Consequently the tooth was extracted, and filled out of the mouth, roots and crown; the tartar was removed thoroughly from the roots and the tooth returned to its place. For three or four days the patient suffered considerable pain, but in a few weeks it was comfortable and firm, and now, about five months since the operation was performed, she has a whole tooth, except the part destroyed by decay. In fact, it is the firmest tooth in the arch, which is full, and the gum has a more perfect union than it has had for years.

Another case was that of the daughter of a market gardener. The tooth was a right second lower molar, with large coronal decay, involving the pulp. The tooth had ached for a month, and she came with orders to have it extracted, which was done. She waited until an assistant had cleaned and filled the tooth, root and crown, when I replaced it in its socket, much against the wishes of the patient, who feared it would have to be extracted a second time, as well as being opposed to disregarding parental orders. The tooth gave her some trouble and pain for three or four days, but in a week was as firm as ever, and no one could tell, on examination, that it had ever been out of the mouth.

Another case: Miss P——, aged 25 years, having always remarkable freedom from sickness of every kind, and certainly free from any constitutional taint, has given her teeth unusual care, came under the care of Dr. H—— three years ago. The left superior central incisor was quite loose and elongated, perhaps 1-16 of an inch longer than its fellow, the gum no longer embracing the neck of the tooth, but discharging a whitish secretion. The patient said this had been the condition of the tooth for several years. Dr. H—— attributed the loosening to a deposit of tartar on the root, and passed an instrument under the gum, removing everything foreign to the parts, but found no tartar. Extra cleanliness only was advised, after

a few dressings of chloride of zinc. About six weeks ago the patient presented herself to Dr. H—— with the determination of having the tooth (which was ⅛ of an inch longer than its fellow, and loose) extracted, and an artificial one substituted, but was willing to make almost any exertion to save it. An impression was taken and a rubber plate made to fit and cap the crowns about 1-16 of an inch, making allowance for that tooth to be placed in its normal position. The tooth was extracted, root canal filled, and, as the socket in the jaw was not deep enough to allow the tooth to go up to its place, I took a coarse bur and bored it out, drove the tooth up with considerable force, put in the plate, and the patient was not seen for three weeks, though she wrote she was getting along quite well a few days after. Now the tooth is more firm than before it was extracted, the gum shows a better color, and the patient's appearance is much improved.

I have replanted nineteen different teeth; centrals, laterals, bicuspids and molars, all pronounced worthless or hopeless cases if treated in the mouth, and out of that number only four have been extracted the second time.

FAILURES, OR QUESTIONABLE CASES.

Another case was a right lower second molar, nearly excised from the gum and process by a thin scale of brown tartar; the pulp dead. The tooth was extracted, the roots and a large buccal decay filled with oxy-chloride of zinc; the roots were cleansed of the tartarous scale, which enveloped them within a line of their points, and the tooth returned to the mouth. That tooth was worn comfortably and did tolerable service for one year, though it never grew firm, an attachment being formed only on a part of the posterior root, the anterior bearing evidence of absorption. The case I regarded as a hopeless one from the beginning, as it had been enveloped in tartar so long that the investing membrane was destroyed.

Another case was that of a good healthy boy, twelve years old, a clinical patient before the Illinois State Dental Association, held last May, (1875.) The tooth was a right lower first molar, pronounced by all present a "gone case." Nothing could be done but

extract. Gas was administered, the tooth extracted and cleaned; the roots and pulp chamber filled with pure gold wire and oxy-chloride of zinc; a large coronal filling was built on screws, and the tooth replaced in the socket, the patient to be under the care of resident dentists of Ottawa, who were to look after and report the result. From them I have not heard, but from two or three members of the Association I did hear that the tooth was out. A brother of the boy came home soon after the boy was operated upon, and swore that no dentist should experiment on his brother. But for the untimely interference of aforesaid brother, that tooth, without doubt, would be doing good service now.

Number 2. Dr. L. C. Ingersoll of Keokuk, Iowa. Right lower first molar, with large distal decay, extending into the crown and far down on the root. The pulp had been dead for years, and the cavity had been kept filled with oxy-chloride of zinc for a long time by the patient himself. He had offered that tooth to several distinguished operators of Chicago to make some reputation on. An appointment was made to fill it next day. At supper at the hotel the writer met Dr. Ingersoll, who was dreading the operation as only one familiar with such complications can. He said, however, that he would enjoy seeing and helping to fill that tooth out of the mouth; so after supper we repaired to the office of our worthy President. The tooth was extracted with a good deal of difficulty, but the posterior root, having so little support, broke off, and also an eighth of an inch obliquely from the buccal side of the point of the anterior root. That root was enlarged on the posterior buccal border, and of such a shape that it could not be removed without breaking it or the septum between the roots. Here was a molar crown with but one root, and part of that gone; it was, therefore, decided to make a bicuspid out of it, which was accordingly done. I did not stay to see it replaced, but the Doctor wrote that his "one-legged tooth" was getting along well and does good service, except on the very hardest kinds of food, and he thinks in a few months it will not be affected by that.

Now, gentlemen, I assume the position that for all cases where the pulps are dead, or beyond restoration to vitality, or those with incurable fistulous openings (nearly always the result of imperfectly filled root canals), taking all risk of breaking by extraction into

consideration, these teeth can be more successfully treated, and more of the organ saved by treating them in this manner than in any other. The pain, exhaustion and loss of tooth substance, the frequent luxation and the continued soreness and occasional ulceration attending these operations in the mouth, fully equal the worst effects attending a case of replanting. While I would not recommend carrying this to the extent reported in the unfortunate case treated by Dr. Barker, I feel that a large number of the teeth removed by accident or through error of judgment, or for other causes, might be restored to usefulness and rendered effective organs of mastication, by determination and a small exertion on the part of the operator.

[NOTE:—At the date of going to press, (January 15, 1876,) Dr. Morrison adds: "I have had about a dozen cases since this paper was written, all with good results except one."]

REPORT OF THE COMMITTEE

ON

Instruments and Appliances

The committee on Dental Appliances beg leave to report as follows: We find it quite impossible to give any detailed report upon such appliances as have come before us, from the fact that the time given us for such examinations has been, of necessity, very short, and had we attempted any other than such a brief report as is here presented, we feel that we might have done injustice to some, and given undue credit to others. We therefore make this our apology for the brevity of our report, and, as far as possible, give only the points that are claimed by the inventors or dealers presenting the same, and not attempting, to any great extent, to give our own opinions of their merits or demerits, as the case may be; and your committee here suggest, for the benefit of those who may follow us in this extremely difficult and thankless task, that all those who shall have any new inventions on which they wish an intelligent report before this body, be requested (if possible) to send the same to this committee as long before the time of the next meeting of this Association as they conveniently can. Many things, we are well aware, are too bulky and heavy to be so disposed of, yet, if the smaller ones could be examined and thoroughly tested before the

time of making the report, it would very much relieve the committee by giving them more time for an examination of those that still remain.

Of motor powers, two have been presented, that seem, in a measure, to satisfy a demand long felt. The Bastet motor is driven by electricity, is consequently noiseless, or nearly so, and has the advantage of being portable. It is sold by S. S. White, who brought it before the committee for inspection.

The Backus water motor is a very compact, complete and cheap mode of securing the power that it seems to be capable of furnishing. It is applicable only in places that are supplied with water pressure. It can be made portable by using rubber tubing for attachments instead of the ordinary lead pipe.

In pluggers, a number have been presented as new, and others as improved. Among the former is an automatic, invented by Dr. T. L. Buckingham, designed to be used with the burring engine shown by S. S. White.

Dr. W. G. A. Bonwill presents his electric plugger very much improved, the weight having been reduced and, at the same time, the power increased. As now presented, it seems to be entirely practicable.

Johnston Bros. present Gaylord's pneumatic plugger, very much improved. As now manufactured, it is either driven by the rubber foot-bulb, or attached to the engine.

Messrs. LeVin & Swartley present a new automatic plugger which is different from most automatics in being operated by a series of levers instead of springs, thereby reducing the amount of friction required to operate it.

Dr. Corydon Palmer presents a very beautiful and complete case of plugging instruments, thirty-five in number, which bear evidence of being the result of much thought and care both in design and manufacture.

Johnston Brothers present a set of pluggers, fourteen in number, devised by Dr. A. H. Brockway, and designed to be used with the hand mallet. They are of extremely simple forms; those intended to be used with cohesive gold having smooth and slightly convex surfaces, and being without sharp edges or angles. The handles

are varied in size and style, to be more readily recognized, and to more perfectly adapt them to the work.

Several new improvements in burring engines have been made in the past year. The Bonwill engine resembles, in some respects, the well known standard engines, in the power being conveyed from the driving wheel to the tool through a shaft and flexible spring; adjustability being obtained by the shaft sliding through the driving pulley. It is very ingeniously contrived.

Johnston Brothers presented an improved "Elliott," or Suspension engine. The improvements consist of a reduction of the size of the hand-piece, a very efficient way of securing the tool, and the substitution of a fly-wheel in place of the ball, to give the necessary weight for securing the required power. This fly-wheel being attached to the shaft which carries the tool, gives great steadiness of motion. An ingenious application of the fusee movement, well known as employed in watch works, takes the place of the suspension weight, and will remove the objection which some have felt to its use.

Edson & Evans present a portable suspension engine, but it seems to us not to possess sufficient merit to receive our commendation. Nevertheless, we are free to admit that a practical trial of it might show that it possesses all the merits claimed for it.

Johnston Brothers brought to our notice a new form of extension treadle for dental engines, in which torsionary movement is applied in a very effectual manner. This is the invention of Dr. A. H. Stevens.

S. S. White presents for the notice of your committee an improved bracket and table. The bracket, by a simple and ingenious appliance, admits of being raised or lowered quite sufficiently for all practical purposes, holding itself firmly in whatever position placed. It also has a lateral motion well adapted to the accomodation of the operator.

Johnston Brothers present a bracket table, the invention of Dr. W. N. Morrison, the peculiarity of which consists of its capability of being opened and folded up like a lady's fan. When closed it serves the purpose of a small chest of narrow drawers; when open, the operator has before him an ordinary bracket table, though divided off in many small compartments.

Johnston Brothers also brought before your committee a simple device for the locking of the castors of the Morrison chair, designed to prevent its moving on the floor when placed in position.

S. S. White presents an improvement on the Harris chair. It consists in a device by which the upper section of the back may be entirely removed, thus allowing the head-rest to fall several inches lower than it otherwise would, and by this means shortening the back; also an arrangement by which the arms of the chair may be entirely removed if required.

Geo. W. Archer presented some improvements in the chair bearing his name, the principal of which is an arrangement by which a lateral motion may be given, thus allowing the chair proper to be turned completely around upon its base if desired; also an improvement by which the whole body of the chair may be raised, independent of the seat; and another in the way of a compensating spring, which, upon the chair being lowered, is wound up like the spring of a watch, but upon the raising of the same, expends the accumulated force as a lifting power.

The Buffalo Dental Manufacturing Company presented for our consideration a dental chair, the invention of Dr. Geo. E. Hayes. This chair, while it has undoubtedly been the result of much study and a large amount of inventive ability, yet, to your committee, seems much too complicated in its mechanism for practical application; it combines an innumerable amount of movements, all of which are, probably, useful, yet some of them not sufficiently so to compensate for the time lost to arrive at the result desired.

The committee have had their attention called by Dr. O. C. White to his improved dental operating chair, with attached spittoon and table bracket, and his portable head rest. The marked features of the chair, as now made, are extreme simplicity of movement, with what seems all needful range to meet the various requirements of the operator as well as the patient. With these are combined an elegance of appearance that will make it compare favorably with any of the other chairs known to us, and fit it for a place in the best appointed operating room.

The bracket is substantially what has been seen before, but with some minor improvements which make it a very convenient article to have about the chair.

The portable head-rest has been improved by the substitution of a dissecting ball and socket joint in place of the hook and eye, and this change, as it seems to us, is of evident advantage.

Codman & Shurtleff called the attention of this committee to a new dental cabinet, the invention of Dr. Cogswell. This addition to the operating room seems to us to fill a place long vacant. Its very great compactness when not in use, and perfect adaptation for the purpose designed, when in use, seem to be recommendations sufficiently strong to command your attention.

S. S. White offers to the profession an improvement in the hand-piece of the burring engine, consisting of adjustable bearings, which, being of steel, and tempered very hard, are intended to be much more durable than those generally in use. This improvement is the invention of E. T. Starr.

Dr. F. Abbott presents an improvement in the back-action hand-piece for the burring engine, which is simple in device, and should be seen to be appreciated.

R. S. Williams introduces to your notice a new and very complete device for holding his gold as prepared in either cylinders or pellets. This consists of a neat morroco case, in which are fitted glass vials, properly labeled, in which the gold is kept, thus keeping it free from exposure to both air and dust, and at the same time allowing the operator to see at a glance what he has before him.

The same gentleman also presented what he styles his "untrimmed gold;" all that he claims for this is that, by leaving the edges of his foil untrimmed, he can furnish it to the dentist at a less rate than when trimmed. This, he wishes it understood, only applies to his adhesive gold.

S. S. White presents a lamp and warm water cup. This little device is a combination of gold annealer, water heater and mouth-mirror holder, and seems to fill a place on the operating table heretofore vacant. This was manufactured from the suggestions of Dr. E. A. Bogue. Johnston Brothers also called our attention to a very imilar arraugement, designed for the same purpose, known as the 'Dental Factotum."

Codman & Shurtleff present an ether and gas inhaler that, in the judgment of your committee, excels anything of the kind that has ever been brought before the profession. Its adjustments are all so

perfect, and the changes for the administration of the different agents are so easily and quickly made that it is quite impossible to describe it, and it can only be appreciated by being seen.

Johnston Brothers present an improved gasometer, which is really a very beautiful and elaborate piece of dental furniture for the office, and which can be used in connection with the liquid gas, or that made in the ordinary way. It is beautifully ornamented and nickel plated, and, therefore, will not be affected by contact of the water. We believe that those in need of an apparatus of this kind, can do no better than purchase this one.

Dr. C. R. Butler's instrument for making and inserting retaining screws will, we think, be found very servicable. By their use the screw is made and cut off at any desired length.

An air syringe, improved by having a metal shield covering half the bulb, to secure greater steadiness in use, is shown. We believe it would be improved were the nozzle made larger.

A double-liped, clamp, devised by Dr. F. Hickman, and intended to facilitate the adjustment of the rubber dam in difficult cases, seems to be a useful device. This, as well as the two foregoing articles, were handed in by S. S. White.

A clamp mirror, devised by Dr. E. Osmond, for the purpose of throwing and concentrating light upon the cavity to be filled, we think, will be of service. It is very simple and easy of adjustment.

Dr. O. A. Jarvis' separators, much improved over those brought before us last year, were shown. We believe they will be found of much value, especially in making examinations of teeth in crowded arches.

The Bowman-Allen clamp forceps has also been improved, it is claimed, and is thought to be now what is wanted in such an instrument.

A tape forceps, devised by Dr. E. A. Bogue—a modification of the artery forceps—will, we doubt not, be found very useful for many purposes about the chair. A spring catch holds the blades of the forceps firmly upon any object that may be seized. The foregoing articles were offered by Johnston Brothers.

Codman & Shurtleff presented a very simple and efficient tape

carrier, and inexpensive withal. Also a foil carrier, or tweezers, combining sufficient strength with extreme lightness.

A file carrier and mouth mirror, presented by the same parties, meet our approval for their simplicity and adaptation to the purposes for which they were designed.

Much ingenuity has been shown in devising appliances for mounting and carrying corundum disks. The device of Dr. Geo. H. Cushing seems to us to possess the greatest merit; by the application of the tortionary movement, as used in coupling the shafting of machinery, the disk can readily be set to run at any angle desired.

Dr. W. G. A. Bonwill's, and Dr. F. Hickman's appliances for the same purpose, have both been improved, and are scarcely less effective.

Dr. G. W. Klump's porte polisher, for use in the engine, will commend itself for its simplicity; it clamps the corundum point, or whatever may be used, firmly, and is a manifest improvement over the hollow mandrels at present used. Dr. Bonwill's chuck for securing instruments, works in much the same way.

An improved mandrel for mounting disks, by Dr. R. Huey, wherein the nut ordinarily used is replaced by a screw, is a manifest improvement.

Among other articles of equipment for the dental engine which have been brought to our notice, are Bonwill's disks, both of soft rubber and of hard rubber and corundum, for separating and polishing teeth. Also, his diamond reamer, designed to effect separation of the superior incisor teeth upon the palatal aspect. We believe these to possess much merit.

Dr. Butler's corundum points, designed for polishing, will, no doubt, be found a useful form; and the same may be said of a style of bur cut like a bastard file, which, it is claimed, will cut more readily and with less jar than the ordinary form, besides being more lasting.

A rubber "pouch bib," from the house of Johnston Brothers, designed to protect the clothing of the patient from the overflow of saliva which frequently takes place during long operations, seems to your committee to meet the end desired.

Ransom's vulcanizer and celluloid packer was presented by the inventor, whose idea seems to have been to combine two instruments in one, which seems to possess much merit as a fine piece of mechanism, but owing to the extreme difference in the modes of working the two materials, celluloid and rubber, your committee cannot see the advantage to be derived from buying the apparatus combined; for those who use the one will hardly ever use the other. Again, celluloid is clean to work, while rubber is quite the reverse. Again, the two instruments apart cost no more than the one combined.

Dr. S. B. Brown & Sons present a celluloid apparatus for dry heat, which possesses the merit of being exposed to view so that you are at no loss, at any time during the process of packing, to see at a glance how the work is progressing. It can be used either with alcohol or gas.

Geo. E. Hayes also presents a celluloid apparatus, which can be used either with dry or steam heat. It possesses the merit of being made cheaper than the one previously mentioned, which is accomplished by using it in connection with either a Hayes or Whitney vulcanizer.

S. S. White also presented a dry heat celluloid apparatus, (Heindsman's patent) which possesses the merit of being contained in a neat case, and can be opened and examined at will during the process of packing.

S. S. White presents an improved laboratory lathe with a flexible pitman, which is so compact that it can be used with equal advantage either in the laboratory or operating room. It has a neat black walnut cover, and is in no way objectionable as a piece of office furniture.

All of which is respectfully submitted.

GEO. L. FIELD,
A. H. BROCKWAY, } *Committee.*
G. R. THOMAS,

Pathology and Therapeutics

[There were no reports upon these subjects, but, upon motion, they were taken up, and the following discussions ensued.—SEC.]

DISCUSSIONS.

DR. ATKINSON: I have a few remarks which I wish to make to men who are competent to apprehend what I say. I think I have gone further into the apprehension of the change which occurs when physiological becomes pathological action, than most men. All works on pathology seem to treat it blindly. Inflammation is known to be a process, *par excellence*, of disease. I wish now to take up the point as to where physiological nutrient action becomes pathological nutrient action, and trace the activity as minutely and distinctly as possible, so that we shall be able to say when the nutrient dominion is remanded from one category to another of the modes of motion that constitute the nutrient activity. It is known to you that if you expose a portion of the skin and strike it, it immediately becomes white, and afterwards returns to the normal flesh color, and immediately succeeding that there is an increased amount

of redness. Now, what is the process by which these appearances make their advent? Pressure drives the neurine out, or arrests the motion of the neurine in the vaso-motor nervous system. It is well known that the function of this class of nerves is to keep up the activity of the capillary system, so that the distribution of the blood shall be equal, and find a due transference from the arterioles to the venioles. Almost all nutrition taking place within the capillary territory, the transudation of nutrient pabulum takes place in this amorphous part of the capillaries. When a sufficient disturbance of the movement of the neurine shall have dominion of the territory, a permanent relaxation of the capillaries of the part ensues, and that gives us congestion, and arrests the circulation, so that it now is remanded back to the mode of nutrition denominated cellulation, which obtains in the vegetative method of nutrient action, and if that is continued, the consolidation ceases to be of that kind. And now, it is remanded back to consolidation after the manner of crystallization. In this way we get the changes so as to form fluids first into soft-solids, and then the soft-solids into solids by the deposition of all the solids in the neighborhood which are capable of consolidation. That is one termination; but when there is not sufficient crystallizable material present to induce deposits of that kind, we will get tuberculous deposits. Inflammation is set up through the loosely held affinity of the molecular mass, by which disintegration is set up, and if that continues, gases are generated, and the absorption of the gases into the blood corpuscles constitutes dead corpuscles, which turn into pus corpuscles.

Disintegration is really chemical, because chemistry means synthesis and analysis. There are two expressions of chemistry. The one means building up and the other mode, or reverse action, is simply taking apart. And in the lowest territory capable of being remanded back to this mode of motion, chemistry seizes upon the mass, and we get corrosive pus. If there be crystallizable materials in the territory, and in contact with that sanies, the further expression of that analyzing activity of chemistry seizes upon and dissolves the crystals and lime salts resident in them, and changes the character of the sanies into what we call *ichor*, the personification of evil in tissue.

We often see, in healthy organizations, a sufficient amount of capital in the immediate neighborhood to carry on the function of the part, and tolerate this sericoid mass. This red line I call sericoid, which means small aneurisms, distended capillaries. If I am understood, I am able to proceed to the next step. Anybody who has sufficient vitality to maintain suppuration in a chronic ulcer or fever-sore, may be cured inside of four days, or eight days at the most, just as certainly as you can make a union by first intention, by taking out the tuberculous mass, or any other heterogeneous mass within the territory. And how? If you cut into that sericoid line it will bleed. Those flabby vessels, having only the amount of vitality which remains of the connective tissue corpuscles constituting the amorphous walls of the capillary system, have open mouths, and being in connection with the heart, the action of that organ prevents their contraction. Go outside of the sericoid line, and cut through the skin and go through the external tissue entirely around that line, and then treat with a solution of chloride of zinc, twenty to forty grains to the ounce. That will give you coagulation of the capillaries on the healthy side of the tissue, and allow you to operate so as to obliterate the ulcer. If the ulcer is so large that you cannot go under it, after staunching the blood, slit up and bring the tissues of the sides together so as to form a union by first intention. This sericoid line runs through the entire extent of the ulcerous cavern just as it does upon the outside, but not being so well supplied with capillaries, is full of proud flesh—fungus. You must go below the sericoid line, within the crater of the ulcer, or else you have the same condition of things as before. Now, how shall we do this and prevent our patients losing too much blood? My idea is to excavate the whole mass, make an incision in the connective tissue, so as to cut the skin with its substratum of fat. Go down where there are vessels capable of bringing a certain amount of pabulum to unite the parts, and take the handle of the scalpel and dissect the connective tissue off enough to close over that territory, being careful to arrest the capillary action, and give time for coagulation to take place, and have union by first intention.

Now, what is the line of demarkation between necrosis and what I have been teaching? Ulceration is necrosis; it is necrosis of the

corpuscles in the flesh. Caries is simply superficial necrosis where the alternation of generation in a tissue is suspended, whether in hard or soft bodies. It is the soft-solids in the bony tissues which operate all function.

DR. TAFT: Do you apply necrosis to soft tissues?

DR. ATKINSON: Yes, I do.

DR. TAFT: The remarks of Dr. Atkinson are instructive. There are some points in them of practical bearing, where they come into every day operation; for instance, in the treatment of disease of the gums, where there is this engorgement and disease so often found. containing deposits upon the necks of the teeth. Upon the anterior part of them there is frequently a calcareous deposit. Now the point I wish to reach is this: by the removal of the deposits, that which has induced or kept up this condition, it is generally remedied, but sometimes it is not possible, by such treatment or by the application of medicaments to the gums, to remove it. In such cases, sometimes in connection with these two, sometimes only with the former, a simple rubbing or pressure upon the gums, kept up for some time, will bring them to a healthy condition, by pressing out from the gums these dead corpuscles that remain in these distended capillaries, and allowing the vessels to be filled with fresh blood.

Dr. Atkinson speaks of putting diluted chloride of zinc in the incision he would make outside of this vascular enlargement point around the ulcer. What is the object? It is simply, as I conceive, that the chloride shall arrest decomposition, and so the production of poisonous gases and offensive material. I have experimented some in the same direction with salicylic acid, and I think it will accomplish the purpose better than chloride of zinc, and I would substitute that solution for chloride of zinc.

As you know, Dr. Riggs, of Hartford, Conn., makes a specialty of this thing, and he relies upon the removal of salivary calcareous deposits upon the roots of teeth for effecting a cure of disease of the gums produced in this way. He not only removes the deposits upon the roots of the teeth, but passes his instrument around upon the inner surface of the detached gum, and destroys these distended vessels, removing the poisoned blood, *debris*, etc., and permitting a restoration of healthy circulation. The blood corpuscles, freighted with their nutritive elements, come into the part, and they not only

supply nourishment to it, but they tone up the vessels, and bring them back to their normal condition. In order to a more thorough removal, Dr. Atkinson used to apply aromatic sulphuric acid. That secures a more complete removal of this material, and also acts as a stimulus on the soft tissue.

THERAPEUTICS.

DR. ATKINSON: On the spur of the moment it is difficult to produce anything worthy of the name of a report upon a subject of such importance to us, as a body of men set to rectify untoward functional action in the oral cavity. To the long list of remedies familiar to our literature, we have had one important addition within the year. I refer to the active principle of the phenic or carbol series, viz: salicylic acid. My own experience in its use contradicts the record of all who have written upon the subject, so far as I have read. They all agree in the assertion of its non-corrosiveness when applied to living tissue, and all agree that it is an excellent antiseptic, with which I cordially concur.

It is nearly inodorous, and also nearly insipid, but it is a beautiful light escharotic, when properly applied, in substance or solution, in ether, alcohol or glycerine. It is slightly soluble in pure water, at a normal temperature, more so in boiling water; but when cooled it precipitates largely, although retaining a larger proportion when dissolved in hot than cold water. I dissolve to saturation in alcohol, and use this in full strength for dressing ulcers, and wiping out cavities before filling. Pour this alcoholic solution into water to make a disinfecting mouth wash and deodorizer of spittoons, etc., etc. In fact, it now supersedes creosote and carbolic acid in most cases in my daily practice. As a means of staunching capillary hemorrhage, it bids fair to succeed without destroying the epithelium as do the stronger agents used for this purpose. As an ingredient in dentrifices, I would expect it to excel in arresting and preventing the formation of noxious gases, without offending the senses.

There is oftentimes a disposition of fault-finding among men when criticising the efforts of the seeker after the best agent for the production of certain desired actions upon the organism, and some-

times when we have run through a series of experiments, being for the time enamored of each successive article we use, we may fall back upon that which had been discarded, as being superior to any of those we had preferred during the glamour of our first love. I am a free-lover of that kind. I only admire the agents that do the work the most advantageously, easily and effectively. Yet I confess I do not know but I was the first to use creosote in dentistry. I have never seen a bad result from its use in the hands of a person who understood its application. I would much sooner suspect the manipulative skill and acquaintance of the person with the affinities of this agent for the albuminoid tissues, then suspect the merits of the thing itself. I know it is a deadly poison when taken into the stomach, but that is not the purpose for which the dentist uses it. When diluted to a high degree it acts almost as quickly as electricity. My first acquaintance with it was as an agent to cure dyspepsia. Beginning with four drops to the ounce of water (I have used as high as sixteen) I found it admirable in some forms of dyspepsia.

I am now using salicylic acid for the same purpose for which I used creosote in the mouth. I apprehend, if we understood its application, it would be equally medicinal in its systemic effects. So far as its use in the mouth is concerned, there are different views relative to its action, but all, I think, agree with me that it does not act as an escharotic, coagulating the albuminous substances in the mouth so as to form an eschar. It is beautiful in its application to ulcerous walls or gums that are just on the point of exuding in pus. It has such an affinity for the elements of the flesh that it combines, and is as self-limiting as its parent, creosote, is, so far as its combinatory action is concerned. Any failure to effect a good result by its use must be set down to want of skill and knowledge. Something has been said as to the difference of action between the perfectly colorless article and that which is slightly tinged. As to the difference in color, I do not know the cause, and as to any difference in effects, I have never been able to detect any. In salicylic acid we have very nearly chased the active principle of creosote into a corner.

DR. TAFT: I have used this agent (salicylic acid) some, for perhaps, four months past, and with decidedly good results. My brother

and son have also been using it during the same time, and it has been an almost continuous course of experiment. We have used it as a preventive of inflammation, and in cases where it seemed very difficult to remove a chronic inflammatory condition. I will give a case simply as illustration. My brother had a superior central incisor which became devitalized some ten years ago. It troubled him afterwards, more or less, with soreness about the roots, and at length the root canal was opened through the palatine surface, the *debris* removed, and the tooth treated with carbolic acid and creosote for some time, without, however, removing the soreness. Finally it was filled up with a pellet of cotton moistened with creosote, placed in the canal as near the end of the root as possible, and covered with gutta percha. It remained in this condition until about three months ago, when, my son having been making some experiments with salicylic acid, he proposed to remove these materials and try it in this case. He found the odor of creosote entirely gone, and the canal very offensive. The patient remarked that there never had been a day during these eight years when there was not a sense of soreness upon tapping it, and a great deal of the time it was painful when he would bite upon it. The canal was accordingly cleaned out, and the salicylic acid introduced, the remainder of the canal being filled with os artificel. The soreness was almost immediately removed, and he has not been troubled with it since.

I usually apply it in the form of a saturated solution in sulphuric ether. That dissolves more than anything else I can find. We have used it for abscesses with a similar good result—in abscesses discharging through the gums. In every such instance its use has been attended by very beneficial results.

I apprehend that its great value lies in its disinfectant and antiseptic properties, in its preventing the decomposition of materials that prove so exceedingly offensive when decomposed, and its tendency to form combinations with such materials when decomposed, so as to make them inoffensive.

These are the things chiefly which it accomplishes. I have not thought it very highly escharotic in its character. Certainly it is not so to the extent of creosote or carbolic acid. The whitening which is spoken of when it is brought into contact with albuminous substances I have not observed, nor can I state how far it tends

to stimulate vital activity in a part to which it is applied. It is, at all events, an agent well worth our attention, and one which should be thoroughly tested.

We get this agent, as you know, in the form of clear, white crystals, and also in those of a yellowish cast. I asked a chemist upon what this difference depended, and was informed that it was simply because the yellowish kind had not been refined to the extent that the white had, but that it was just as good for practical purposes as the more refined.

As to the "dental pain obtunder," I will state that I have used it for eight or nine months, in many instances upon sensitive dentine. Not always, to be sure, with perfect success, but generally with very desirable results. I have used it considerably when excavating, and have been enabled, through its use, to operate upon the most sensitive dentine. The active principle in it is from horse-radish.

At the meeting of the Ohio State Society a gentleman had an inferior wisdom tooth filled which was largely decayed upon the buccal surface, and exceedingly sensitive. In attempting to clean the tooth out the most extreme pain was caused, and I was compelled to resort to the remedy under discussion. I put in some of the preparation before putting on the dam, which allayed the pain some, and after putting on the dam, made another application, when the patient became perfectly quiet.

In regard to carvacrol, I do occasionally use it, but I have failed to get such good results in the treatment of abscesses and dead teeth as some of my professional brethern profess to have got.

Dr. W. H. Allen: I have used the "dental pain obtunder" without any good results; it makes me positively sick, and I want none of it.

Dr. Stockton: My patients complain of the smell of it. I have found no benefit from it whatever. I have used salicylic acid successfully. I think a great deal of the trouble with dead teeth depends upon cleansing them too thoroughly at once, a thing I do not attempt to do.

Dr. Osmond: I have used a preparation called "king of pain," for sensitive dentine, which, I have been informed, is oil of mustard. I have found oil of peppermint the most useful of any application for sensitive teeth.

DR. FLAGG: I have tried all the various oils, and oil of peppermint is the worst I know anything about; it will make patients fairly howl. My experience with the "dental pain obtunder" is half-way between that of Drs. Taft and Allen. It does not seem to do much good, and occasionally is exceedingly painful. I have observed that a remedy will sometimes do great things for one person, and nothing for another. I have found "Pond's Extract" a very valuable application for inflammation, and have known of its being used with great advantage in wounds, such as gunshot wounds, etc. I am obliged to use all kinds of remedies, allopathic and homeopathic, and even this, which is a quack remedy.

DR. SHEPARD: Temperament makes a great difference with the use of pain obtunders. The nervous effect is often a great deal. If you tell a patient that you are going to use some wonderful thing, and use only water, it will frequently have a great effect. In Boston we do not have such very sensitive dentine; we have only a few patients, mostly young persons, with whom it is necessary to use any obtunder. The miasmatic influences of certain localities render dental troubles more obstinate, and aggravate inflammation. I have found benefit from the "dental pain obtunder" in some instances.

DR. ABBOTT: I am not at all pleased with the "pain obtunder." It often produces intense pain. In one mouth it seemed to be productive of some good, and the same day in the same mouth it did no good. It smells badly. I hope, as the result of some experiments now in progress, to be able to produce something that will do the work without pain.

DR. MORRISON: A knowledge of how to excavate, not taking too large chips, and with keen instruments, will succeed best. I have used thymol and other agents, but think there is nothing superior to good old-fashioned creosote.

DR. I. KNAPP (Ft. Wayne): Some agent that would control sensitive dentine would be a boon to those operating in miasmatic regions. The "dental pain obtunder," I think, causes no more pain than any other cold substance. In my region the teeth that are not sensitive are the exception. I have found lime-water, used for three or four weeks, very beneficial. I am sometimes compelled to resort to blue pill, quinine and iron before I can operate without dan-

ger of devitalizing the pulp, and often I cannot treat exposed pulps without doing so. Specific poison must be eradicated before the teeth can be operated upon successfully.

DR. BUTLER: It is possible that electrical conditions may have something to do with this matter, and possibly the condition of the operator. The "pain obtunder" has a sickening odor, but in many cases I have found great benefit from it; I think the pain caused by it is due to the coolness produced.

DR. C. S. SMITH: I have observed something like constitutional effects from this agent; it seems to stupefy the whole system. It is my opinion that it is a powerful drug, and should be used with caution. I have heard it suggested that it contains hasheesh.

DR. HARLAN: It is composed of oil of mustard, camphor, aconite and ether.

1876.

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OF THE

AMERICAN

Dental Association

AT ITS

16TH ANNUAL SESSION

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MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION,

SESSION OF 1876

BY C. STODDARD SMITH, SECRETARY.

METHODIST CHAPEL, BROAD AND ARCH STREETS,
PHILADELPHIA, August 1, 1876.

THE Sixteenth Annual Meeting of the American Dental Association convened at the above time and place, the president, Dr. A. L. NORTHROP, of New York, in the chair.

At the request of the president, the proceedings were opened with prayer, by Dr. MORGAN, of Nashville.

The roll of permanent members was called, and the following delegates and permanent members were reported as having paid their dues, those marked with an * not being present, but forwarding their dues:

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STOCKTON, C. S. ..... Newark, New Jersey.
SMITH, D. D. ..... 1,417 Walnut st., Philadelphia, Pennsylvania.
*SWAIN, E. D. ..... 67 Washington street, Chicago.
SAGE, H. L. ..... Bridgeport, Connecticut.
SMITH, C. STODDARD ..... Springfield, Illinois.
SMITH, J. H. ..... New Haven, Connecticut.
SMITH, A. WILKES ..... Richmond, Kentucky.
STELLWAGEN, T. C. ..... Philadelphia, Pennsylvania.
STURGISS, S. M. ..... Quincy, Illinois.
SMITH, H. A. ..... 286 Race street, Cincinnati, Ohio.
SEABURY, F. N. ..... Providence, Rhode Island.
SALMON, IRA A. ..... Boston, Massachusetts.
SMITH, JOHN S. ..... 210 Locust street, Columbia, Pennsylvania.
SWARTLEY, J. S. ..... 749 Michigan avenue, Chicago.
SPELLMAN, B. T. ..... Detroit, Michigan.
*SCRANTON, J. N. ..... Bennington, Vermont.

TAFT, J. ..... 117 West 4th street, Cincinnati, Ohio.
THOMAS, G. R. ..... Detroit, Michigan.
THOMPSON, J. R. ..... Newbury, South Carolina.
THOMPSON, J. S. ..... Abbeville, South Carolina.
TRUEMAN, W. H. ..... Philadelphia, Pennsylvania.

ULRICH, H. G. ..... Baltimore, Maryland.

WOODWARD, J. A. ..... Philadelphia, Pennsylvania.
WINDER, R. B. ..... Baltimore, Maryland.
WATERS, G. F. ..... 8 Beacon street, Boston, Massachusetts.
WELLS, MERRITT. ..... Indianapolis, Indiana.
*WHEELER, C. F. ..... Albany, New York.
WEATHERBEE, I. J. ..... Boston, Massachusetts.
WALLACE, W. T. ..... Kingsville, Ohio.
WHITSLAR, F. S. ..... Youngstown, Ohio.

WEBB, M. H ..... Lancaster, Pennsylvania.
WERT, AMOS ..... Philadelphia, Pennsylvania.
WAID, A. J ..... Newton, Iowa.

The reading of the minutes was then proceeded with, but upon motion, the further reading was dispensed with.

Upon motion the rules were suspended to allow Dr. Shepard to introduce the following resolution :

Resolved, That dentists not resident in the United States who may be present, and whose names may be approved by the executive committee, are hereby invited to seats upon the floor, and to participate in the discussions.

The resolution was carried.

The report of the committee on physiology was called for, but as the chairman was not prepared, a paper upon the subject was read by Dr. Brockway, (a member of the committee,) entitled, "The Health of the Dentist as Affected by Modern Modes of Practice."

The executive committee, under the resolution so providing, introduced Dr. E. Wilson, of Havana, Cuba, and subsequently the following gentlemen : Drs. J. Carlos Gardner, Madrid ; Geo. Cunningham, London ; W. McGrath, Pernambuco ; N. Emmons, Santiago, de Chili ; Wm. Armstrong Vice, England ; T. J. Thomas, Madrid ; W. St. G. Elliott, Yokohama, Japan.

On motion the rules were suspended, to hear the report of the special committee on the health of dentists, appointed last year ; and Dr. John Allen, chairman, read the report.

A discussion of these papers then took place, participated in by Drs. Kingsbury, Barker, Flagg, Wetherbee, Rehwinkle, Stellwagen and Thomas.

The committee on credentials made a report, which as amended by various supplemental reports, was finally adopted.

[This report never having been in the possession of the secretary, having been lost or mislaid, is necessarily omitted.—SEC].

The executive committee reported the printed program, recommending that it be changed so as to add an evening session on Wednesday, and the program so amended was adopted.

Drs. Buckingham and McQuillen gave notices of invitations to visit certain objects of interest.

Adjourned.

FIRST DAY—AFTERNOON SESSION.

The Association was called to order at 2:45, by the president. The discussion of papers on Dental physiology was declared in order, and remarks were made by Drs. McDonneld, Stockton, Prof. D. D. Smith, Atkinson and McQuillen.

The report of the committee on physiology was then presented by Dr. McQuillen, and the same was discussed by Drs. Shepard, Peirce, Atkinson, Morgan, Abbott, Kingsbury, Flagg and Butler.

Upon leave, Dr. Buckingham moved the appointment of a committee to take action in regard to the death of Prof. Wildman, and the motion being carried, the chair appointed as such committee, Profs. Buckingham, Taft and Chandler.

After some further remarks by Drs. Butler and McQuillen, the subject of physiology was passed.

The next subject, dental pathology, was called, and Dr. Flagg, chairman of the committee, read a report.

Dr. Hunt moved that the report of the committee on pathology be accepted and adopted, and that that portion of it creating a section on pathology be referred to a special committee of three, with instructions to report at one of the meetings of this session as to the expediency of dividing the Association into sections on all subjects, and if in their opinion expedient, to submit a plan therefor.

Carried, and Drs. Hunt, Atkinson and Morgan appointed as the committee.

On motion, the further consideration of the subject of pathology was suspended.

Dr. Shepard moved that the selection of place of next meeting and election of officers be made the special order for Thursday evening, at 8 p. m. Carried.

Adjourned.

FIRST DAY—EVENING SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of chemistry was called, but no report being ready, it was postponed.

The subject of therapeutics was called, and no reports being offered, it was also postponed.

On motion, the subject of pathology and surgery, which had been postponed, was taken up, and a volunteer paper by Dr. W. N. Morrison, was read by Dr. Shepard.

The subject was then discussed by Drs. Shepard, Barker, Flagg, Jno. Allen, Rehwinkel and I. Knapp.

Dr. Ambler moved that Dr. Hill, of Brooklyn, (not a member) be requested to present certain cases believed to be of interest.

On motion of Dr. Shepard, this motion was indefinitely postponed.

The discussion on pathology was then resumed, and participated in by Drs. Abbott, Stellwagen, Bogue, Morgan, Barker, Harlan, Flagg, Wade, Rehwinkel and McQuillen.

On motion of Dr. Shepard, the regular order of business was suspended for the introduction of a motion, and Dr. Shepard moved a reconsideration of the vote by which the motion requesting Dr. Hill, of Brooklyn, to present certain cases, was indefinitely postponed; pending which motion the meeting adjourned.

SECOND DAY—MORNING SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of pathology and surgery was still under discussion, and after some remarks by Dr. Waid, the subject was passed.

The committee on chemistry was called, and there being no report, the subject was postponed.

The committee on therapeutics was called, and asked for further time. Granted.

The rules were suspended to receive a supplemental report on credentials, which was accepted and adopted.

A congratulatory telegram from the American Dental Society of Europe was received, and upon motion of Dr. Shepard, the president and secretary were authorized to answer the same appropriately at the expense of the association, which was accordingly done.

The subject of operative dentistry was taken up, and Dr. Frank Abbott read a report. Dr. Harlan also read a supplemental report on the same subject.

A volunteer paper on the transplantation of teeth, by Dr. W. N. Morrison, and extracts from one on the same subject by Dr. Taft, were then read.

The subject was discussed by Drs. James Leslie, Kingsbury, Barker,

Wetherbee, Morgan, Stellwagen and Hunt, after which the meeting adjourned.

SECOND DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of operative dentistry being still under consideration, was discussed by Drs. McDonneld, Barker, Stellwagen, Ambler, Taft, Sturgiss, Field, Morrison, Atkinson, Thomas, and Corydon Palmer.

On motion of Dr. Shepard, the rules were suspended for miscellaneous business, and the executive committee offered a resolution which, after stating that Dr. Jas. Leslie, (who was not eligible as a member, not being a practicing dentist,) had been admitted under a misapprehension of the facts, instructed the treasurer to return the dues paid by him, and take his name off the roll. Carried.

The committee to take action on the death of Prof. Wildman presented the following resolutions, which were supported by Dr. Buckingham, and their adoption was moved and seconded:

WHEREAS, In the midst of life we are in death, yet in our profound sorrow we bow in meek submission to the mysterious dispensations of Him who doeth all things well;

WHEREAS, In the sudden and unexpected death of that esteemed and valued member of our profession, Dr. Elias Wildman, we have lost a most valuable member; one by whose untiring labor for the last forty years the profession has been incalculably benefitted; who as an investigator and teacher stood in the very front ranks, and whose discoveries and contributions will endure as long as the profession exists; Therefore be it

Resolved, That we mourn the less of our departed brother, the evidence of whose labor and ability and good works were seen every day. That as his professional career was one of constant labor for our benefit, so his private life was pure and unspotted, exhibiting a rare combination of those virtues which constitute the true man and good citizen. That although the place which has known him shall know him no more, yet his name shall not be lost, for it is imperishably written in his works.

Resolved, That we tender to the family and friends the condolence and sympathy of this Association, and that these resolutions be entered on the minutes and a copy sent to the family.

Resolved, That a memorial page in the published Transactions be appropriated for the record of these resolutions.

T. L. BUCKINGHAM, J. TAFT, } *Committee.*

Dr. Field, from the committee of arrangements, moved that a session be held on Thursday, p. m. Carried.

A motion to adjourn was made, which Dr. Goddard moved to amend by adding, "until 9 a. m. to-morrow."

The amendment was lost, and upon motion, the meeting adjourned.

SECOND DAY—EVENING SESSION.

The Association met, pursuant to adjournment, at the Philadelphia Dental college, at 8 p. m., the president in the chair.

The subject of operative dentistry was still open, and was discussed by Drs. McQuillen, Crouse, Shepard, Butler, Clowes, Field, Keely, Bogue and John Allen, after which the subject was passed.

The subject of chemistry was then taken up, and Dr. S. B. Palmer, chairman of the committee, read a report, after which the meeting adjourned.

THIRD DAY—MORNING SESSION.

The Association met pursuant to adjournment, the president in the chair.

The order of business was temporarily suspended for miscellaneous business.

The report of the treasurer was read, and upon motion was accepted and adopted, as follows:

Wm. H. Goddard, Treasurer, in account with American Dental Association.

1875.		Dr.	1875.	Cr.
August, To balance		$189 75	By paid voucher No. 1	$ 68 65
To dues, 1872	$ 5 00		By paid voucher No. 2	125 00
To dues, 1873	30 00		By paid voucher No. 3	50 00
To dues, 1874	60 00		By paid voucher No. 4	50 00
To dues, 1875	555 00		By paid voucher No. 5	350 00
		$650 00	By paid voucher No. 6	21 00
		$839 75	Total expended	$664 75
			Balance	175 00
				$839 75

Philadelphia, August 1 1876. W. H. GODDARD, *Treasurer.*

We have examined the report of the treasurer and found it correct.

FRANK ABBOTT, M. H. WEBB. } *Committee.*

The subject of chemistry being resumed, a paper by Dr. Cassidy, one of the committee, was read by Dr. Shepard.

A volunter paper on the same subject was also read by Dr. Taft.

The subject being open for discussion was spoken upon by Drs. D. D. Smith, Wetherbee, Barker, Clowes, Mills, Cunningham of England, Flagg, Webb and Palmer.

The subject was then passed, and that of therapeutics was taken up, which was opened by a report written by Dr. Brackett, one of the committee, which was read by Prof. Shepard.

Dr. Atkinson followed with a report, oral and written, upon the same subject.

Dr. Shepard moved that hereafter, during the session, speakers be limited to five minutes at one time, and to two speeches on each subject. Carried.

Adjourned.

THIRD DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of therapeutics was under discussion, and remarks were made by Drs. Barker, Atkinson, Dixon, Dean, Hunt and Jno. Allen, and the subject was passed.

The committee on mechanical dentistry was called, and opened by a report from Dr. Morrison, chairman, who was followed by Prof. D. D. Smith, who read a report written by Dr. Barrett, another member of the committee, and followed with a verbal report of his own, after which, upon motion, the subject was laid upon the table, and the next one taken up.

The committee on etiology made a report by each of its members, Drs. Hawxhurst, Webb and Sage, who read their reports, after which the meeting adjourned.

THIRD DAY—EVENING SESSION.

The Association met pursuant to adjournment, the special order being selection of place of next meeting and election of officers.

The selection of place of next meeting was declared in order. On motion it was voted that the selection be made by ballot, and that after the first ballot, all except the three highest be dropped.

It was moved and seconded that no member speak more than once, nor over two minutes upon nominations. Carried.

The ballot was then proceeded with, and upon the fourth ballot Chicago was selected.

The election of officers was then proceeded with, with the following result:

President—Geo. W. Keely, Oxford, Ohio.
First Vice President—C. N. Peirce, Philadelphia.
Second Vice President—Corydon Palmer, New York.
Corresponding Secretary—J. H. McQuillen, Philadelphia.
Recording Secretary—C. Stoddard Smith, Springfield, Ill.
Treasurer—Wm. H. Goddard, Louisville, Ky.
Executive Committee—(New Members)—G. H. Cushing, J. N. Crouse, A. L. Northrop.

On motion, the meeting adjourned.

FOURTH DAY—MORNING SESSION.

The Association met pursuant to adjournment, the president in the chair.

After the reading of the minutes, the subject of etiology was declared open for discussion, and remarks were made by Drs. Hawxhurst, Clowes, Abbott, Hunt, McQuillen and Atkinson, after which the subject was passed.

The committee on dental literature was called, and Dr. M. S. Dean, chairman, proceeded to read a report, when it was moved that the reading be suspended on account of want of time, and that the paper be referred to the publication committee. Carried.

A volunteer paper upon the same subject was then read by Dr. W. H. Dwinelle.

The rules were suspended for the purpose of attending to miscellaneous business.

The following resolutions, offered by the executive committee, were adopted:

Resolved, That the treasurer be authorized to pay the drafts of the publication committee, as required.

Resolved, That the treasurer pay the bills of the committee of arrangements, janitor, and salaried officers.

Resolved, That the treasurer notify all permanent members of their arrearages, and the necessity of paying the same.

The committee on nominations made their report of committees for the ensuing year, which on motion was accepted and adopted.

	PHYSIOLOGY.	
M. S. Dean,	R. B. Winder,	J. N. Farrar.
	PATHOLOGY AND SURGERY.	
I. Knapp,	J. Taft,	F. H. Rehwinkle.
	HISTOLOGY AND MICROSCOPY.	
C. N. Peirce,	E. D. Swain,	H. C. Longnecker.
	CHEMISTRY.	
S. B. Palmer,	J. S. Cassidy,	C. J. Essig.
	THERAPEUTICS.	
C. A. Brackett,	C. R. Butler,	F. M. Odell.
	OPERATIVE DENTISTRY.	
G. H. Cushing,	A. W. Harlan,	F. J. S. Gorgas.
	MECHANICAL DENTISTRY.	
W. N. Morrison,	F. A. Hunter,	M. W. Foster.

ETIOLOGY.

D. C. Hawxhurst, M. H. Webb, H. L. Sage.

LITERATURE.

W. A. Bronson, A. L. Northrop, E. A. Bogue.

EDUCATION.

L. Jack, J. N. Crouse, Thos. Fillebrown.

PRIZE ESSAYS.

W. H. Morgan, B. Lord, L. D. Shepard.

The special committee on sections made a report, through its chairman, which was received and adopted, as follows:

The special committee having in charge the subject of dividing the Association into permanent sections, which shall be analogues of the present standing committees, beg leave to report progress, and respectfully submit the following statement and recommendation:

That the committee, after consultation, are unanimously in favor of the contemplated measure, but have not time at the present session to prepare such a report as the importance of the subject demands. They therefore recommend that the Association permit them to continue their labors, and report fully at the next annual meeting.

R. FINLEY HUNT,
W. H. ATKINSON, } *Committee.*
W. H. MORGAN,

The executive committee offered the following, which was adopted:

Resolved, That it is the sense of this association that all papers which will require more than fifteen minutes to read, shall be reduced by the writers to a synopsis which shall not occupy more than 20 minutes in the reading, the paper as a whole being referred to the publication committee.

The following resolution was adopted:

The executive committee would recommend that the salaries of the treasurer and secretary be raised to $100 per year.

The publication committee read its report, which, on motion, was accepted and adopted.

The publication committee have to report that they have had published 350 copies of the Transactions of 1875, in a style of print, paper and binding identical with those of the previous year, in order that the two volumes may be bound in one by members, in any style they may choose. They have been distributed by the committee in the usual manner, and at the opening of this session, about 200 copies remained on hand.

The amount expended by the committee, as per bills and vouchers, for printing and distributing the transactions and other printed matter, is as follows:

Credit.

Printing Transactions	$248 00	
Printing Illustrations for same	110 75	$358 75
Wrappers and Circulars		3 00

Postage, Stationery and Express charges		41 14
		$402 89
Printing 1,000 copies Constitution		20 00
		$422 89

Debit.

To Balance on hand from last year	$ 20 95	
To Cash from Treasurer	350 00	
To Cash from Books sold	11 30	
		$382 25
Balance due the Committee		40 64
		$422 89

Your committee desire to call attention to the fact that the Transactions of this association fail for some reason to reach and consequently to benefit the profession at large. This body expends considerable money year by year in placing in permanent form the results of its deliberations; yet from year to year there remain in the hands of its officers a large number of volumes which are not sold, and which have heretofore been disposed of for the postage. It seems to be a matter of regret that this is the case. It would seem to be the province of this body, if its Transactions are of any value, to place them before the profession; and yet it may be considered injustice to the members who have paid their dues, to allow others to become possessed of these volumes without assisting in defraying the expenses of the publication; yet when published, it would appear to your committee better that they should be offered for sale by advertisement or otherwise, at even a nominal price, so that they might be rendered useful, rather than remain as so much waste paper. As to the best method of doing this, your committee are not clear, but we suggest it for your consideration. C. STODDARD SMITH, *Chairman.*

On motion of Dr. Barker, the secretary was instructed to expunge from the minutes the objection to the resolution relative to the memorial page in memory of Dr. Wildman.

It was moved and seconded that when this session adjourns, it be to meet at the call of the president on the boat this afternoon. Carried.

Dr. Taft moved that back volumes of the transactions may be furnished to libraries of colleges on payment of postage. Carried.

On motion of Dr. Bogue, the vote by which the reading of Dr. Dean's paper was suspended, was reconsidered.

The report of the committee on the status of dentistry, was, at the request of the chairman, referred to the publication committee.

Dr. Thomas moved that the publication committee be instructed to advertise back volumes of transactions at the nominal price of $1.00.

A motion to refer the report of the committee on appliances to the publication committee, was lost.

The regular order was returned to, and the reading of Dr. Dean's report was concluded.

The subject of dental education was then taken up, and the chairman, Dr. Morgan, read a report.

Dr. Crouse, another member of the committee, asked to be excused at this session, and no objection being heard, it was laid over till the next session.

Dr. Keely spoke to a question of privilege, and of personal explanation.

Dr. Buckingham moved to lay the whole matter on the table. Carried.

On motion of Dr. Crouse the newly elected officers were installed, and the new president, Dr. Keely, took his seat.

The president appointed as the special committee of arrangements for the next session, Drs. Dean, Harlan and Honsinger, of Chicago; and as members of the publication committee, Drs. A. L. Northrop and L. D. Shepard.

On motion, the chairman of the committee on appliances was allowed to read his report on the boat.

The minutes of the morning session were read, and on motion the meeting adjourned, to meet on the boat this afternoon.

FOURTH DAY—EVENING SESSION.

The Association met at 8 o'clock, in the cabin of the steamer John A. Warner, on the Delaware river.

The report of the committee on instruments and appliances was called for, but the time being insufficient and the circumstances not being favorable for its consideration, it was moved and seconded that the report be referred to the publication committee. Carried.

A volunteer paper, by Dr. E. Wilson, of Cuba, on dental education, was also, for like reasons, similarly referred.

Dr. Hunt moved a resolution of thanks to the profession of Philadelphia, for their courtesy and kindness. Carried.

It was moved and seconded that the thanks of the Association be tendered to the Academy of Natural Sciences and the University of Pennsylvania, for courtesies received; also to the trustees of the church in which the meetings were held, for the use of the edifice. All of which were carried.

Dr. Bogue moved a reconsideration of the vote by which the next place of meeting was fixed at Chicago. That motion was laid on the table.

A motion to adjourn was made and carried, and the Association was accordingly declared adjourned, to meet in Chicago on the first Tuesday in August, 1877.

C. STODDARD SMITH, *Secretary*.

In Memoriam.

WHEREAS, In the midst of life we are in death, yet in our profound sorrow we bow in meek submission to the mysterious dispensations of Him who doeth all things well;

WHEREAS, In the sudden and unexpected death of that esteemed and valued member of our profession, Dr. Elias Wildman, we have lost a most valuable member; one by whose untiring labor for the last forty years the profession has been incalculably benefitted; who as an investigator and teacher stood in the very front ranks, and whose discoveries and contributions will endure as long as the profession exists; Therefore be it

Resolved, That we mourn the loss of our departed brother, the evidence of whose labor and ability and good works were seen every day. That as his professional career was one of constant labor for our benefit, so his private life was pure and unspotted, exhibiting a rare combination of those virtues which constitute the true man and good citizen. That although the place which has known him shall know him no more, yet his name shall not be lost, for it is imperishably written in his works.

Resolved, That we tender to the family and friends the condolence and sympathy of this Association, and that these resolutions be entered on the minutes and a copy sent to the family.

Resolved, That a memorial page in the published Transactions be appropriated for the record of these resolutions.

THE HEALTH OF THE DENTIST,

AS AFFECTED BY

MODERN MODES OF PRACTICE.

BY ALBERT H. BROCKWAY.

A very general and probably well founded impression prevails among the members of our profession, that the occupation in which they are engaged is one, which more than most others, taxes the physical energies, and lowers the standard of health of its followers. In a paper which was read before this body at its meeting a year ago, and in the lengthy discussion which followed it, this view was taken with scarcely a dissenting voice, and, so important did the subject seem, that a committee was appointed to investigate the matter, inquire into the causes, and, if possible, to suggest the means for better conserving the health of the dentists.

The melancholy, not to say alarming, statistics with which the paper was fortified, might well

"damp with omen of our own decease"

the most hopeful and vigorous among us, were we not sustained and quieted by that feeling within, which makes

"All men think all men mortal but themselves."

Nevertheless, since we cannot, if we would, divest ourselves of a certain degree of apprehension for our *friends*, the subject must necessarily possess for us a more than passing interest.

Not purposing in any sense to encroach upon the province of the committee, I desire, in a very brief manner, and without by any means exhausting the theme, to direct attention to what would seem to promise a more hopeful outlook for the dentist of the future than has been enjoyed by his prede-

cessor; I refer to the probable influence of the modern modes of practice upon the general health of the practitioner.

It will not be questioned that there has been within the past decade a marked change in the methods of practice, and taking the latter half of that period, the change has been scarcely less marked in the *ideas* which guide and govern us therein, than in the means and instruments employed.

To speak of the change in ideas, no one can have failed to observe (and some have observed it with unconcealed regret) the prominence which has been given in our discussions and publications, to the subject of amalgam, and that, from being the black, proscribed, and hated thing it formerly was, whose use, even though occasional, and in the most extreme cases, must be admitted with "bated breath," it now comes boldly back into the ranks, emancipated and disenthralled by the genius of scientific and unprejudiced investigation, and takes its rightful place as a valuable, and at present, indispensable adjunct in the salvation of a large class of teeth.

When it is considered that this material is now very generally used among respectable practitioners in that class of cases the management of which formerly, most taxed the endurance and vitality of the dentist, namely, those pulpless and more or less broken-down teeth, requiring a considerable amount of restoration, often involving, in the use of gold, several hours of most laborious and exhausting effort, it will, I think, be apparent that the change in this respect has been for the benefit of the operator, at least, in a physical point of view.

Not so marked as the example just noted, but still in the same direction, is the more general use of non-cohesive gold, and the combination of gold and tin which now obtains. Leaving out of the question the merits of these forms and combinations of material, as compared with strictly cohesive gold, which was but a few years since almost exclusively used, it will be seen that in this also the comfort and convenience of the operator is promoted, inasmuch as their use involves far less time than does cohesive gold.

Still further in the same direction is the influence exerted by more enlightened and intelligent ideas upon the subject of the treatment of nerve cases, the management of cases of irregularity, the preliminary wedging of teeth, etc., all of which are now undertaken and accomplished in notably less time and with more ease than formerly, and consequently lighten in like degree, the burden of the practitioner.

More important than all else, yet mentioned as conducing to the relief of the operator, is the employment of an assistant at the chair; a practice which, though by no means so general as it should be, is yet becoming more so year by year, and the value and advantage of which can scarcely be overestimated. Fortunate indeed is the man who has the co-operation of an intelligent, faithful assistant, an *alter ego*, watchful of his needs, ready and quick to supply them, saving a hundred little steps and movements, as well as

relieving him of the more fatiguing duties of running the engine or malleting his fillings.

Turning now from this brief and imperfect consideration of some of the ideas which have tended to modify our practice, let us consider the probable effect of the introduction of some recent instruments and appliances: the mallet, the rubber dam, and the burring engine. I name them in the order of their introduction, which is perhaps in the inverse order of their importance. Leaving out of question in this view of the matter, all consideration of the interests of the patient, which it would be easy to show, were subserved not less than those of the operator, I hold that the employment of these three adjuncts, is doing a vast and incomputable amount of good to the profession at large, in the matter of their physical well-being, not only in relieving the severe and often protracted muscular effort, as is the case with the mallet and engine, but also as in the case of the rubber-dam, sparing the mental anxiety frequently attendant upon the operations of filling with the use of napkins, in the "good old way," an anxiety, which, to a conscientious and painstaking operator, is often far more exhaustive than the accompanying physical exertion.

Since it is admitted that much of the ill-health complained of is the result of the confinement within doors, almost of necessity imposed upon the dentist engaged in such a practice as will comfortably support his family, it will not be difficult to show that these means, the mallet, the engine and the dam, are destined to work powerfully in his favor by not only lessening his labors, but abbreviating them as well, thus leaving him in a better condition to enjoy that out of door exercise and recreation, so necessary to his well-being, which their employment allows him to take.

REPORT OF THE COMMITTEE

ON THE

HEALTH OF THE DENTIST,

BY

J. ALLEN, CHAIRMAN.

Your committee, to whom was referred the subject of the "Health of the Dentist," beg leave to submit the following report:

From a careful investigation of this subject, we find that the peculiar nature of a heavy dental practice tends to overtax the system of the dentist, more severely than that of other professions or callings.

The reasons assigned for this by many of our members (eminent in their profession) are, that it is evidently due, not only to his close confinement but more especially to the numerous intricate and prolonged operations which he is often required to perform under trying circumstances, and also to a consequent neglect to observe and obey certain well established physical and mental laws to which man is amenable.

These laws are found to be universal, and for wise purposes irrevocable. No class, profession or calling is exempt or out of their jurisdiction. They have their rewards and punishments. If carefully observed and obeyed, they bring their recompense; if disregarded—their penalties, whether from ignorance or neglect.

Now, in our profession, we think there are those who neglect the observance of these laws, more from a careless indifference, perhaps, than from a want of knowledge upon this subject, for as professional men we are supposed to understand them, but if we fail to recognize and observe them, a plea of ignorance or neglect will not change or avert the consequences, for in our physical, as in our civil laws, all are presumed to know them, and their violation incurs corresponding penalties.

Therefore, in our profession, it seems the more important that these laws should be thoroughly understood, and faithfully obeyed, for as we cannot change the nature of our calling, we should endeavor to so modify our habits and system of practice as to accord as nearly as possible with the laws of health, for as before stated the nature of a heavy dental practice is such that it tends to overtax the system of the dentist more severely than that of other callings.

By way of illustration, let us look for a moment at the medical practitioner. He visits his patient, which affords him a walk or ride, either of which promotes health, and when at his place of destination, he proceeds to diagnose his case, writes his prescription, gives directions for the care of his patient, all of which occupies some fifteen or twenty minutes, and then is off again upon another mission of a similar nature, and thus passes the day with him. In the meantime the dentist is confined to his room, perhaps performing some difficult operation in the mouth of a nervous irritable patient, which exhausts his vital force at a rapid rate.

At length the patient is dismissed, and another, who has been waiting, takes the chair, and his duties are again repeated, without any intermission for a walk or ride, as his neighbor the doctor has. And thus passes the day with the dentist. And as with these two men to-day, so is it repeated tomorrow, next day and next week, and as with days and weeks, so with months and years.

The one has plenty of fresh air and out door exercise, while the other is denied both, and thus the equipoise of the mind and body of the *one* is maintained, while in the other case there is an undue expenditure of vital force, from prolonged tension upon the brain and nervous system.

Many other like examples might be given, but we prefer that each one should draw his own parallels.

Now, you will observe that in the case above named, the dentist has failed to obey the requirements of at least two important laws of health. First, he has permitted his brain and nervous system to be overtaxed by means of prolonged operations; and secondly, he has denied himself a sufficient amount of exercise in the open air to throw off the waste or spent particles of his body, to give place for fresh supplies for the system.

The penalties for these transgressions, when oft repeated, are head-aches, indigestion, constipation, irregular appetite, a blurring of consciousness, and disintegration of ideas. These, together with gloomy presentiments and dark misgivings, are pathognomonic conditions of cerebral anæmia, and if long continued, are liable to result in dementia or insanity, especially when prolonged tension upon the brain is of a chafing or irritating nature, as often occurs in dental practice, for, as Dr. Brichton Brown, of the Wakefield

Asylum, says: "Let me press this truth upon you, that it is not pure brain work, but brain excitement or brain distress that eventuates in brain degeneration and disease.

Calm, vigorous, mental labor may be pursued without risk or detriment, but whenever an element of feverish anxiety, wearing responsibility, or vexing chagrin, is introduced, then come danger and damage.

Here we have the two forms of mental toil well contrasted, which clearly illustrates the effects of mental worry upon the brain, and also how physical conditions may conduce to the development and aggravation of mental distress."

Again, we find others whose dental rooms are small and poorly ventilated, consequently the operators are subjected to the ill effects of an impoverished atmosphere for respiration, especially in cold weather.

They seem to have forgotten that a man breathes eight hundred and thirty-three times every hour, which requires over one and a half hogsheads of pure air, or double that quantity for two persons, himself and patient. This element conveys to the lungs, with their nine millions of air cells, their natural food, and you will recollect that inspired air is life giving, and expired air is life destroying. As a proof of this, experiments have shown, that to put a mouse into a bottle and cork it tight, although the bottle may contain air in bulk ten times greater than that of the mouse, yet in a short time the mouse will die. History furnishes most appalling instances of human beings perishing in a short time from breathing expired air. Probably many of you recollect the circumstances of one hundred and forty-six soldiers being ordered into a small unventilated hole in Calcutta for a single night; in the morning one hundred and twenty-three were dead, and nearly all the survivors died soon after with putrid fever.

In chemistry, you will recollect, there is a law of diffusion, which causes a minute intermingling of gases or odors with the surrounding atmosphere, and a small escape of gas will soon mix itself equally with all the air in a room; so with noxious vapors exhaled from the lungs, though less perceptible, as evinced in crowded halls, even for one hour. Therefore, small and illy-ventilated operating rooms are found to be detrimental to the health of the dentist.

Again, we find other operators with impaired nervous systems, who resort to narcotics and stimulants for relief. There are different kinds of these substances used by man in different parts of the world, all of which are classed under the head of poisons. These are the coca leaf, the betel nut, tobacco, hemp, opium, alcohol and thorn apple. These are all more or less intoxicating in their effects, yet they differ in their nature and degree, but we will only dwell upon such as are used in this country, and upon this

point we invite your special attention. We learn from our anatomical researches that the human body is built up atom by atom, and when fully formed and developed, consists of the head, trunk and limbs. These different parts of the body are formed from some fourteen different nutrient substances, which are contained in the food designed for man. These together with pure air and water are *all* that *nature* requires to build up and sustain the human structure. Therefore narcotics and stimulants are foreign substances, that do not assimilate with human tissue, nor can they (like food) enter into, or form any part of the living organism of man. Yet, under certain abnormal conditions of the system, they may serve a temporary purpose when judiciously administered, but no permanent good can result from the habitual use of them, and with many persons, moderation is so hard to maintain, that these substances should be shunned rather than embraced by over-worked dentists, who may have no reserve force to spare, to eject them from the system. For example, those who have become habituated to the use of opium, either by chewing, smoking, or in a liquid form as laudanum, are ever gradually increasing the quantity, in order to stimulate the benumbed brain and nervous system up to the desired narcotized condition. From the initial dose of thirty or forty drops, De Quincy says he "was seduced into the accursed habit, and at length became an opium drunkard, and the few drops at first, which spread rosy visions before him, soon became an hundred, and the hundred became a thousand, and so continued to increase, until his daily consumption was eight thousand drops."

And so it is with the other fashionable poisons referred to. For instance the experience of the tobacco devotee, whether in chewing or smoking, tallies with that of De Quincy, with his opium. From the small cigarette occasionally, the confirmed smoker at length consumes a dozen or more cigars per day.

And the half gill of spirituous liquor occasionally taken at the beginning, grows upon the habitual dram drinker to a quart or more per day, to say nothing of the physical or mental results that follow in their train, which are too well known to require comment from us at this time. And just here please to note the different results upon the system, between substances that are not nutrient, and those that are.

According to physiological teaching and practical experience, narcotics and stimulants fail to supply the natural wants of the body with proper nutrition, and the system seems to call for more! more! more! which the devotee to their use, interprets to mean more liquor or tobacco, as the case may be, whereas, with the proper quantity of nutrient substances to meet the normal demands of the system, enough is all that is required, and the man of sixty craves no more water to drink, or food to eat, than he did at the age of thirty.

It is the law of waste and supply that is to be complied with on our part, and nothing more is required to sustain a sound body, and a vigorous mind, than the few simple materials here referred to, which are supplied by the Creator in just the right proportions from nature's laboratory, and whenever we depart from the established laws of nature, we transgress the laws of health. But, says the confirmed smoker, my cigar affords me the greatest enjoyment I have; and his demeanor verifies his words. See him in the gay evening assemblage, where music, beauty, wit and talent rule the hour; he longs for the poisonous nicotine, and seeks another room or a walk in the dark, where he can hold sweet communion with tobacco smoke. The higher sensibilities of his nature seem to have become so torpid that the delights of the drawing room sink into insignificance compared with the pleasures of a cigar. Or if he be a devotee to strong stimulants, then he seeks the social glass with others like himself. Now let us fall back to some of the fundamental principles upon which our profession is based, and there we find that these and other like substances are not auxiliaries or addendas to the laws of health. But on the contrary, when used to excess, they lead to the transgression of those laws. An eminent English medical writer upon this subject, says "A stimulant is an agent which enables the system to use up more of its stored force than it could otherwise do, in other words, it enables a person to borrow from himself. The system possesses the power of using up so much of its force, and no more; the rest is held in reserve; a stimulant enables the individual to use up some of the reserve force—to borrow from himself."

Now this loan, however useful at the time, has, sooner or later to be met; and just here note the difference between the use and abuse of spirituous liquors. If they can be used as a convenience for a time only, their injurious effects will not be perceived, for the incomings of vital force from proper nutrition will be sufficient to replace the loan. But if the loan from the body-bank is oft repeated and not repaid or met by the incomings, then there comes a permanent deficit, and physiological bankruptcy is the result.

In conclusion, your committee would recommend to overworkers, that a less number of hours per day be devoted to dental practice, and when operations are of a rasping nature let the hours be shortened, and make it a point to take as much out-door exercise as circumstances will permit. With reference to operating rooms, they should be large and well ventilated.

Narcotics and stimulants should not be habitually used by our members, as they are found to be far more detrimental than beneficial, to both body and mind.

DISCUSSIONS.

DR. KINGSBURY (Philadelphia): I feel very much gratified to think that the health of dentists is considered a matter of so much importance as to call for the appointment of a special committee, and I have been very much gratified and profited by the papers which have been produced upon the subject, especially by that of Dr. Allen. That good, sound health, is a prerequisite to the highest success in the practice of our profession, I suppose no one doubts.

The paper of Dr. Allen touches on some very important points: the necessity of complete and thorough ventilation in the dental office, and the importance of free, out-of-door exercise, to the preservation of a good physiological condition. This is something which has engaged my attention for years. It is a common practice on the part of dentists to confine themselves too rigorously to their offices. The possession of strong muscles, and firm, healthy nerves, is as essential to the success of the dentist, as a knowledge of the principles of his art, and the possession of high mechanical skill. For the past twenty years I have been in the habit of taking a vacation during the warm season, always including the month of August.

No class of men expend a larger amount of nervo-muscular force than dentists, and there is none whose occupation more imperatively demands a period of relaxation.

It is not to be questioned, I think, that we, as a people, are living on too high a plane. Our grade of social life has reached too high a degree of refinement, and our habits are too artificial. For many years I have spent my time in the summer along the lakes and streams of New England, and among its mountains and forests. I am particularly fond of angling, and I have found that to be above all others, a healthful and pleasant recreation.

There is one other point to which I desire to call attention, namely, the use of stimulants. I think that Dr. Allen's remarks upon this subject are most truthful and forcible. It seems evident that there is a growing tendency to the use of stimulants in our country among all classes, even among the gentler sex. Our own profession is by no means an exception. A moment's reflection upon the subject will recall to your minds many eminent and talented members of our profession who have cut short their

usefulness, and gone down to premature graves in consequence of their indulgence in over-stimulation. That stimulants occupy an important place in the medical pharmacopœia there can be no doubt, but it is certain that their abuse constitutes a great evil. It is true that the use of stimulants sometimes produces an artificial brilliancy of mind, and that, under their influence, men have produced very many beautiful things of a literary character, but these very men who have, under the influence of liquor, flamed out in such sudden and brilliant mental vigor, would unquestionably have produced much more valuable results, had they wrought them out in the spirit of sober and honest industry. In our own profession there are many times when the depression and exhaustion of an overtaxed system seems to call for some kind of stimulant, and if indulged in, there is an apparent gain in working vigor; but this is really not so, the reaction is invariably greater than the forward impulse. Abstinence from stimulants invariably conduces to clearness of brain, steadiness of nerve, and a healthful tone of the system.

Dr. Barker (Philadelphia): I must say that I am somewhat disappointed by the position taken by the committee. I agree in the main with the views they have advanced, but they have ignored some physiological facts which are quite worthy of presentation. I must differ with those gentleman who regard dentistry as an exhaustive profession. I do not regard it so, nor in the least calculated to shorten life. I believe there is no single profession better calculated to prolong life, and to develop a higher type of mind than dentistry. It is true that dental appliances and facilities have been so limited and so illy adapted to efficient and easy operating, that in times past dentists have labored to great disadvantage, and in a manner which greatly interfered with the physiological processes and functions of the system. It is necessary, in order to have perfect health, that we have perfect nutrition, and perfect nutrition is not attainable when the system is kept in a constrained position. We must have unconstrained peristaltic action—a free movement of the bowels and diaphragm. In order to the maintainance of a proper position, the chair should be so constructed as to be adjusted and regulated entirely to suit the convenience of the operator, and admit of an erect position while operating.

Many dental operations are calculated to call forth the highest skill, ingenuity and study, on the part of the operator, as well as to call into play the physical forces of the system, and I contend that such operations tend to develop the whole man—mentally and physically.

There is another point which is worthy of notice, viz: the influence which different patients exert over us. We are all of us affected, more or less, in this way. You may call it magnetism, or what you will, but certain

it is that one class of patients exert a bracing and tonic influence over you, while others depress and enervate you.

Another thing which I think tends to produce ill health, especially dyspepsia, among dentists, is the fact that they rush into their work too soon after taking their meals—in the morning too soon after breakfast, and in the afternoon too soon after dinner. This, in connection with the constrained positions which they occupy, tends greatly to disturb the functions of the digestive organs. Experiment has repeatedly shown that, in order to perfect digestion, the other parts of the system must be in a comparatively quiescent state, and the natural flow of blood to the stomach which takes place during the process of digestion, must be allowed to go on without interruption. Too many of us eat heartily, and then, without the slightest interval of repose, resume our work. In this way the blood is diverted from the stomach to the brain and other organs, and we have, as a result, mal-nutrition and indigestion.

I agree with my friend in what he says about tobacco and spirituous liquors, with a modification. I do not desire to be understood as advocating or encouraging the undue use of stimulants; but I do say that these things have their uses. It is only their abuse which is to be deprecated. Nor do I think that the statement that dentists, as a class, are addicted to an undue use of stimulants, is correct. I have had a somewhat extensive acquaintance with the members of the dental profession in this country, and I am convinced from my observations among them that exactly the reverse is true of them as a class. Proprietors of hotels have said to me: "I was mistaken in your body. When we have conventions we always take them at a reduced price, believing that we shall more than make up the difference at the bar; but I was mistaken as to your body. They spend very little at the bar."

The gentleman who preceded me seems to overlook the fact that alcoholic stimulants possess considerable nutritive power. I contend that we have in alcoholic stimulants a medicine which is priceless. Every careful physician knows that when properly used, alcoholic stimulants are of a high medicinal value, particularly in cases of consumption.

Dr. Flagg (Philadelphia): I do not rise to speak upon this subject because I feel any special interest in it, or because I think I shall be able to contribute to the discussion any ideas or suggestions of importance. I do not rise with a view of making any converts to abstinence from stimulants. So far as I practice abstinence, it is not with a view of adding to my longevity, for I long since abandoned that idea; it is not with an idea of escaping from a premature grave, for at my time of life I cannot do that; (I am fifty years old). I was educated as a young man, in the Young Men's school of

the Quaker City. That is a very mild school to outsiders, but those who have graduated there know very well what a familiarity with stimulants is acquired during a course there: I know rum and tobacco; I have smoked my twenty-five cigars a day, and then I have smoked my black pipe, so strong that nobody else could smoke it. For fifteen years, as a practitioner of dentistry, I paid my respects to those two stimulants, rum and tobacco, and now, for fifteen years I have not paid my respects to rum and tobacco, and I merely wish to speak for the purpose of supporting those gentlemen who do not use rum and tobacco, or who have abandoned their use. I do not agree with my friend Barker in regard to the wonderful curative powers of alcohol. I have never seen a case in which it has seemed to me that the administration of an alcoholic stimulant produced one single particle of good, and I have seen many cases where I think they have carried a patient to the grave. Make outside applications of these things if you please, but keep them outside.

I agree with Prof. Barker, that within the last twenty-five years, the practice of dentistry has been wonderfully facilitated. Practitioners of to-day know nothing about how meagre and incomplete was the dental outfit of years ago. Why, the appliances of to-day have made the practice of dentistry almost a pastime! I go to my chair now every morning at half-past eight o'clock, and work until half-past five in the afternoon, and, thanks to the various appliances at my command, I do not feel any the worse for it.

PROF. BARKER: I hope I am not understood as advocating the use of rum and tobacco; I only desire to take an enlarged view of the subject, and not a narrow one.

PROF. WETHERBEE (Boston): I was a little surprised to find my friend Barker advocating as strongly as he has done, the theory that there is nourishment in alcohol. The best American authorities, as well as the best foreign writers, assert that alcohol does not nourish the human system, and I believe that the conclusion thus arrived at by those eminent writers is a just one, and one which cannot be controverted by arguments drawn from experience or observation.

The ground is so well gone over by the chairman of the committee, that but little more need be said on the subject of the means of promoting the health of dentists. There is one source of recuperation from the effects of a fatiguing dental practice however, which the author of the paper forgot to mention. One of the very best means of keeping up the tone of the system, is the custom of driving or horse-back riding. If inclined to dyspepsia, he had better take to the saddle, and the harder the horse, the sooner will his dyspepsia be cured. I use both the open carriage and the saddle, and

after the labor of the day, I step into my carriage, and drive, sometimes three hours, always managing to forget, before I return, all the fatigues and vexations of the day. If one is not able to keep a horse, a gentle walk in the open air is an excellent thing. Smoking and chewing are to be eschewed, except in very rare cases, where tobacco is a remedy for a certain terrible disease, and the only known remedy. I go in for temperance, and for hard work, and for the use of all those modern improvements, which have come so timely to our aid. I agree with Prof. Barker, that the dental profession is not particularly calculated to impair the health of the operator, but on the contrary, is conducive to health and long life.

PROF. BARKER: I must differ with the gentleman in his assertion that alcohol does not possess nutritive properties. I deny that entirely. I could refer him to a score of the best writers, who maintain that it does possess nutritive properties—such writers as Stille, Wood, &c. At the same time, I do not wish to be understood as advocating the indiscriminate use of stimulants.

DR. KINGSBURY: Touching the remarks of Prof. Wetherbee, I presume he has derived benefit, in a hygienic point of view, from the use of the horse and carriage. I have been accustomed to the use of horses for a large part of my life time, and I speak advisedly when I say that I am satisfied that the recreation thus derived is not comparable with what one gets in the mountains, and by the side of the streams. For several years I have had, at a certain point in Northern Vermont, three boats, and also two tents, and during the summer I am accustomed to take my rod and fly, and spend my time exclusively along the streams in the depths of the forest. I have also a little instrument—an aneroid barometer—and in climbing hills and mountains, I take a measurement of their elevation; all this gives additional interest to my pedestrian excursions. This kind of life I consider decidedly the best calculated of any to promote health and vigor. The lungs, we know, are the most important organs of the body, in ridding the system, through the functions of respiration, of all effete matter, and where can we have such respiration as under the circumstances I have referred to?

DR. MORGAN (Nashville): No one doubts that the higher is our physiological condition, the more certain are we of success. Dr. Kingsbury says that we, as a people, have become so refined in our habits, that as a result, we have deterioration in the public health; that the habits of refined society are such that people cannot attain to and maintain that high physiological condition which they do under other circumstances. I think he gives that condition of life the wrong name; I do not believe it is refinement, I think it is dissipation. In regard to his assertion that there is a growing indul-

gence in alcoholic stimulants by the female sex, I will say that whatever may be the case in the city of Philadelphia—probably the special sphere of the gentleman's observations—I stand up to deny that assertion, so far as it applies to the sphere of my observation. It is not true of my section of the country, and I believe that in general, in polite or refined society, such habits, so far from being on the increase, are rather on the decrease.

I was not aware that dyspepsia is peculiarly a disease of our profession, nor do I believe that it is, or that it need be, if proper habits of practice and recreation be pursued.

As you are aware, I was appointed a member of this special committee. In going over the state of Tenessee, I find that within the last sixteen or eighteen years, fourteen dentists of my own acquaintance have died. Ten of this number died of consumption, and that in a state where statistics show that there is only an average of thirteen out of every hundred dying of that disease. Three of the remaining four died of urinary disease. If I remember correctly, out of eight who are now in bad health, six are suffering from lung troubles. Now this, to my mind, indicates a lack of exercise in the open air—insufficient out-door life, and I have no doubt that the want of good nourishing food, taken at proper intervals, contributes somewhat to the result. Dentists, as a rule, are irregular in their eating. Circumstances conspire to make them so. The constrained position in which we are compelled to stand much of the time, (for with all our improved appliances, the position must often be trying), is also conducive to disease of the lungs and abdominal region.

I was much astonished at a remark made by Prof. Flagg, as to the value of stimulants in the treatment of disease. I consider the application of stimulants in certain diseases as quite indispensable, for instance in typhoid fever and cholera, and no intelligent practitioner in my section of the country would attempt to treat either of these diseases in their more advanced stages without recourse to alcoholic stimulants.

Dr. Rehwinkel (Chillicothe, O.): I consider the papers presented and discussed here of immense interest, and the points taken are well taken; but I want to utter a word of caution against dentistry being held up as so unhealthful a profession, against exaggeration in this direction, for if that idea prevails, and is sustained by universal consent, we are such creatures of habit, that we will come to take it as a recognized fact, and submit to it as our fate. For my part it is a source of pleasure to me, and a matter of congratulation at these yearly reunions of ours, to find so few changes,—so much apparent well being—to find the friends I parted with years previous all looking so well and hearty. I have in my mind a gentleman now, whom I knew twenty-four years ago, then a handsome, but slender and delicate

person. He has been hard at work since that tme, and has grown stout and fat. My own health twenty-five years ago was delicate; now I weigh fifty pounds more than I did then, and my health is seventy-five per cent. better than it was. If we all lived in the same climate, and under the same influences, we might lay down some general rules to be followed, and specify what is, and what is not deleterious; but we cannot lay down general rules which shall govern men irrespective of temperament and locality. I desire to sustain Prof. Barker so far as stimulants and tobacco are concerned. I occupy the same position that he does. I do not by any means advocate or recommend their use, but I would not decry men who use them in moderation.

PROF. STELLWAGEN (Philadelphia): In the different positions taken by different gentlemen here, each one has a certain amount of justice on his side. I understand Dr. Barker to mean that the use of alcoholic beverages, as prescribed by physicians, is sometimes necessary to stimulate the digestive apparatus. We know that in order to perfect bodily health, the new material which is taken into the system in the shape of food must be taken up and properly assimilated. Occasionally, however, this assimilative power becomes slightly dormant, and then it is advisable to use, for the time being, some kind of a stimulant, and alcoholic stimulants are advantageous in such cases, as where our friend from Tennessee recommends it—in typhoid fever; but it is only to serve a temporary purpose. It is as if, for instance, we had a large and valuable bridge over a river burned down, and should erect a temporary structure to take its place, simply to accommodate the tide of travel until we could rebuild a more substantial one. But, while it is useful in exceptional cases, as a medicine, no physician should ever make use of a drug so powerful for evil as well as for good, without first controlling the use of that drug by ordering it in a certain stipulated manner, and in a certain dose—to be repeated so often—and then stopped. That is my idea of the use of alcoholic stimulants. I hold that it is unsafe for a man to subject himself to any stimulus after he feels once or twice a return of the appetite for that stimulus at any particular hour. If I were to order alcohol in any of its shapes, I should follow it up as cautiously and carefully as I should follow up any of the more dangerous cumulative poisons on administering them. I should ascertain from my patient whether, at the time of administering the dose, his appetite craved the stimulant, and if so, I should advise him to avoid it as he would the sting of a serpent.

We find those living in malarial districts who can work a certain number of months with impunity, and then they are obliged to seek health in more elevated sections of country. Another man works in a region where, so far as climatic influences are concerned, he can devote himself uninterruptedly to his profession; but his professional application is so intense and constant

that when the time for the summer vacation comes, he finds himself broken down and debilitated generally. Now this has always seemed to me a highly prodigal way of living. A person cannot safely or prudently work down his health to low water mark, and then rely upon a period of rest and recreation to bring it up again. Persons who use machines know very well that when a machine needs oiling, it is better to stop the whole machine—the whole factory—to oil a single journal, rather than run on until it is over heated and burned out. The human system needs constant alternation of labor and rest. My practice has been (my experience and observation confirm me in the belief that it is a good one)—my practice has been, to take one afternoon of every week for recreation in the open air, and I have never broken over this rule except in two individual cases. Recreation should be of such a character as to divert the mind from the ordinary routine and cares of your professional duties. It should be the habit of a dentist to throw off entirely business cares after business hours. This is an important lesson for us to learn, and an important one for us to apply in our daily life. It is the constant uninterrupted attrition of business care which wears out and breaks down the machine.

DR. THOMAS (Detroit): There are one or two points to which I desire to call your attention. The first is, the matter of eating. For some eight years I was in the habit of having my dinner at 1 o'clock. My residence is just a mile from my office, and I was in the habit of walking to and from my office at dinner time, but I am satisfied that during that eight years I did four times as much walking as was good for my health. I frequently walked from three to six miles a day, and stood at my chair eight or ten hours besides, and a year ago last spring I was obliged to leave my practice, as I supposed, forever, as I was suffering severely from general debility and nervous prostration. Upon leaving my practice I changed my mode of life. I abandoned walking almost altogether, and my health began to improve, and kept improving until I was able to resume my practice. In regard to eating, I desire to say that I have been in the habit of going to my chair at eight o'clock in the morning, and practicing continually until two o'clock. Then I have an hour I call my consultation hour, which I devote particularly to that class of business which comes in upon us during the day, and which we do not wish to have break in upon our operative practice. I attend to that from two until three, and then I have dinner. I have followed that rule for several months, and I find it to be greatly to the advantage of my health.

I was very glad to hear Dr. Barker say that our profession is not the hardest one in the world in its practice. I do not believe it to be so. I think the multiplication and perfection of dental instruments is such that our profession has been rendered comparatively easy.

In regard to this matter of intemperance: I believe the nearer a man can live to temperance, the better it will be for him and his patients. At all hazards he should be temperate; but at the same time I do not sympathize with the anathemas which some pronounce against spirituous liquors.

DR. MCDONNELD (Conneautsville, Pa.,): I can endorse quite heartily the views expressed by Dr. Allen in his paper. Yet, I think he may be misunderstood in some of his points. In regard to the use of liquor; I do not suppose he desired to be understood as condemning its use as a medicine, but merely as a beverage. I do not, however, agree with Dr. Morgan, in saying that all intelligent physicians in the South recommend the use of liquor in cases of typhoid fever. In the section of country in which I live there are many physicians—homeopathists—who do not use liquor in such cases, and I think, as a general rule, they have as good success as allopathists. My idea is that the health of the dentist is best promoted by a careful attention to hygienic laws—by getting sufficient sleep at the proper time, and under favorable circumstances, by eating sufficient good food at the proper time, without the annoyance of such interruptions as professional calls, while taking it. The idea of having the office and residence combined, I do not consider a good one, inasmuch as it subjects the dentist to constant annoyance of that kind. I have tried both ways, and I find that an office separate from my residence is much more preferable.

DR. STOCKTON (Newark, N. J.): I presume it will be remembered that last year, when this special committee was appointed, it was done in view of the supposed fact that a large number of dentists were becoming insane. Now, in the discussion of this subject, we have gone widely astray of the primary idea involved in the proposed investigation, and have taken up almost exclusively the subject of intemperance. Confining myself to the original idea, I desire to say that I do not think there is anything in our profession peculiarly calculated to produce insanity. I think that dentists, as a rule, are as healthy as members of any other profession, and I can say this with special emphasis if I base the statement upon the robustness of appearance presented by the representative body which I see before me. There are, it may be, some things connected with our profession that do lead, in a measure, to this result; but they should be, and for the most part can be, avoided. There is nothing so conducive to a healthy tone of mind and body as an occupation which is congenial to the taste and temperament of the person following it, and if a person finds himself in an occupation which is repugnant to his tastes, he should abandon it, whether it be dentistry or something else, and pursue one which suits him.

There are some patients for whom we can work with much greater ease than for others; some, in fact, who exercise a specially depressing influ-

ence upon us. Such cases it is a matter of wisdom to avoid treating, as far as we can. Frequently cases come before us which we feel we could treat much better at another time, and I believe a man would do better by suiting, as much as he can, the operation to his state of feeling.

It was said this morning that we must be in perfect health in order to produce the best results. I have in mind now the case of a gentleman who has been weak all his life—having a physical organization of the most feeble kind, who, nevertheless, has done some of the most perfect dental work which I ever saw. That shows that perfect physical health is by no means necessary to perfection of work, although I will admit that it greatly conduces to that result.

PROF. SMITH (Philadelphia): I am not aware of any statistics by which we may judge of the healthfulness or unhealthfulness of dentistry as a profession. The remarks of Dr. Morgan this morning, perhaps approach nearer to what I supposed would be accomplished in this paper, than any thing which has been said. This is a very interesting field of statistical investigation—to ascertain definitely whether dentistry is a healthful profession or not. I have always regarded it as a profession tending to the abridgment of the life of its practitioners. Of other professions we have statistics. Of the three—clergymen, doctors of medicine, and lawyers—clergymen are the longest-lived, physicians come next, and lawyers next. Now, the relation which dentistry bears to these three professions, it seems to me, would be interesting and important. Of one thing, however, we may be assured: true advancement in civilization and mental culture tends to longevity. I know the remark was made this morning that the people of the present day are living on too high a plane of civilization; but it will be found that the people which attain to the highest mental culture attain the greatest longevity; and that which is true of a people, is also true of a class of people.

So the longevity of dentistry, or the lifting of dentistry from a position of unhealthfulness to one of healthfulness, is due not so much to improved implements, as to an advancement in intellectual attainments—to a general development in intellectual culture. To this end, societies like this have greatly contributed; they have lifted dentistry from a position of obscurity to one of great respectability. It is only a few years ago—1839—that the first systematic effort was made to educate for this special calling, and the result has been the establishment of local societies, the establishment of this society, the establishment of dental colleges all over our land, and the elevation of the tone of dentistry throughout the entire country. It is to this fact more than to our use of improved instruments that is due the increase of longevity among dentists. Dental colleges have done much, and it remains for dentists to say what they shall accomplish in the future. It is not alone their object to teach men to preserve the human teeth. They are

to educate men in every department of medicine and in every department of true manhood, and just in proportion as they do this, wlll they lengthen the lives of dentists.

DR. ATKINSON: It seems to me that the proper way of reaching the truth upon this subject, is to lay aside our partisan feelings, and endeavor to get at the foundation of what constitutes food, what constitutes poison, and what constitutes remedy.

It is dogmatically asserted here, on the one hand, that alcohol contributes to the construction of human tissue, and on the other hand it is just as dogmatically asserted that it is a poison. The last speaker has so asserted: but I think it would be difficult for him to intellectually justify that assertion. We do not as yet know enough of molecular metamorphosis to entitle us to dogmatize very much about what becomes of certain substances which disappear from our cognizance when introduced into the human body. Now, competent authorities who have experimented upon the introduction of alcohol into the human system, assert that some portion of it is capable of being collected from the different ejecta of the animal system, but there is also a loss—a reduction of the quantity, concerning the disposition of which in the animal economy, we are quite uncertain, but it yet remains to be settled whether it is appropriated as nourishment or not.

I think there has been a drawing of very weak conclusions upon the question of whether our profession conduces to health or to disease. Over-action or under-action of any machinery will be detrimental to that machinery, and the human organization, varying as much as it does—the human mentality, and desires and æsthetic nature differing as they do, it is difficult for us to set up a standard to which we shall come. In other words, each man who is fit to practice dentistry at all, is entitled to be the best judge of how much he can eudure, with safety to himself and to his patient. If I were asked for a rule of action on the subject, I should give the rule of banking—never to draw all the deposit you have in bank—always keep a surplus. Now, what is the function of alcohol? It is to quicken depressed functional activity. When a man has spent the last deposit of his energy, if he would then take a little brandy and water into his stomach before he puts food into it, he would be better off than he otherwise would be. If I were talking to an assemblage of chemists, and should ask the nature of diffusible stimulants, I should at once receive the answer—something that exists, but which is not quite understood. It has been called catalysis, or action by presence. We may take red pepper, or black pepper, or ginger, or any other diffusible stimulant, and get like results. If I were within reach of oranges, I should prefer the juice of three well ripened oranges to take into the stomach before food, to stimulate the digestive function of the stomach.

As to our profession being particularly detrimental to the organization,

I think that is not so. I conceive it to be the profession of professions to awaken all the energies of the entire human being, and if we were up to the requirements of it, we should be the very tip-top blue blossom of humanity! We should be the culmination of all science and all art.

DR. MCQUILLEN: As was justly remarked by Dr. Rehwinkel this morning, a statement that is made and passes unrefuted, however lacking in foundation, will eventually become accepted as true. Like him, I am disposed to take exception to the position assumed by my friend Allen, that our profession is peculiarly exhausting to the mental and physical energies; and particularly to his statement that our profession tends strongly to insanity. I remember last year he cited several instances of insanity in dentistry, giving the names of individuals. It struck me at the time as exceedingly out of place to mention individual cases, inasmuch as the parties are dead, and it would be a source of considerable mortification to their friends to have their names thus published to the world as dying insane. At my suggestion the names were suppressed by the editor of the Dental Cosmos, and I think the same course should be pursued now. So far as predisposing causes to insanity are concerned, I think they do not exist to a greater extent under a high state of mental excitement and activity, than they do in the rural districts where there is the least amount of excitement and activity of the brain. So far as statistics are concerned in connection with insanity, it will be found that that disease prevails to a greater extent in the rural districts—among farmers—than in any class of the community. I do not consider our profession more exhausting than any other calling which is followed with that devotion of purpose and determination necessary to secure the best results. Wherever we find men devoting themselves assiduously to their calling, we are apt to find many of them falling martyrs to their over-zeal.

DENTAL PATHOLOGY.

[NOTE.—The report of the regular committee being called for, was presented orally by Dr. J. H. McQuillen, chairman. As he nas failed to place it in the hands of the publication committee, its insertion in the proper place is necessarily omitted.—SEC.]

DISCUSSIONS.

DR. SHEPARD: In connection with the report of Prof. McQuillen, I would like to instance the case of a family with which I am acquainted, in which there are two boys. One of them commenced to erupt the temporary teeth at four months, and at eight months had eight temporary incisors. His brother did not have one until he was eight months and a half old, and when he was a year old he had five incisors only. This is a simple illustration of irregularity occuring in the same family, in the same blood, and under the same physical regimen. The boy first cited, at three and a half years of age, had thirteen cavities filled in his molars. I know of no reason for this tendency to decay, except possibly the early eruption and consequent imperfect calcification of the teeth.

DR. PEIRCE: We all recognize the difference in time between the eruption of the permanent and deciduous teeth. Now the question comes up whether there is a difference in the development of those teeth, or simply a difference in the time of the removal of the gum from the surface. Dr. McQuillen spoke of teeth being erupted at birth; I have known two or three such cases where there were two teeth erupted, but those two were not any further developed than those which had not erupted. In my family, one of my children had teeth through at two months, another not until six months of age. In the first there was some peculiar condition of the system and the gums, but so far as I know there was no difference in the condition of the teeth in the two cases. In regard to the difference of time in the eruption of

teeth between the European nations referred to and the United States; when Mr. Tomes was here, and also when I was in London, I saw and spoke with him upon the subject—respecting what we term the seven-year old teeth. In London, parents put their children at work in factories as early as possible. There is a law that no child shall be considered seven years of age until those teeth are erupted, at which age they are allowed to work in the factory. The same law prevails to a certain extent in Paris. I think that Mr. Tomes recognizes the fact that those teeth are through in a majority of cases at six years of age or shortly after. Whatever of premature development there is, I think is due more to a premature absorption of the gum from the masticating surfaces, than to any development of the teeth.

DR. MCQUILLEN: I neglected to say that Saunders makes use of the eruption of the teeth as a means of determining the age of children. The law that was passed through the instrumentality of Sir Robert Peel, did prevent the employment of children at a very early period of life in factories. The order and time of eruption of the teeth was made the subject of investigation, with a practical object—that of ascertaining whether the law was being violated or not.

DR. ATKINSON: There is a point in the development of the teeth which has not been referred to, but which I regard as one very important for dentists to know; that is this: there is a certain relation between the time of the shedding of the temporary teeth and the time of the breaking down of the whole system—the term of longevity. Twelve times the period of the shedding of these teeth is the normal limit of the life of the individual. All tissues are made up of elements that have an origin at one end of the fibre, and the longevity of the fibre depends upon the possibility of the increment of the elements at the inner end of the fibre of the tissue, in other words, the wearing out of the fibre. I can confirm the statement made by Dr. Peirce, that a premature eruption of the tooth does not indicate any special development; it only indicates that the operculum or outer wall of the sac in which the tooth germ is hidden, has lost its capability of appropriating the blood corpuscles, constituting the basis of the cells, and has given way, leaving the tooth exposed. I have a daughter that had one exposed in that way, and I removed it, because of the irritation produced upon the nipple of the mother in nursing. We must understand that progeny is not the product alone of the immediate father and mother, but the product of a long ancestral line of endowment of life.

Now what is the law of evolution of the tooth, and is it, as Prof. McQuillen said, a matter that concerns the individual tooth itself, or its surroundings—an act *per se* of the tooth itself, independently of pressure, or the presence or absence of any other agent? He said it was not a result of

the carneous body; I do not think he can justify that statement. I have yet to see any absorption of bone even, much less of tooth structure that has not a carneous body directly against it. What is a carneous body? It is simply a confluence of the cells of the tissue, like the breaking together of two soap bubbles into one, and they are always present where bone is absorbed, whether there be a healthy or an unhealthy action. Now, that it holds any relation to the absorption, I am not prepared to say. I am not prepared either to endorse the statement that it was not dependent on an acid secreted by the carneous body, or produced by it. I do not think we know what that process is; I think it is physiological, but it may be pathological.

DR. FRANCIS (New York): I simply desire to call attention to one single statement in the report of Prof. McQuillen—a statement which I have heard made before repeatedly; it is this: that the absorption of the roots of the deciduous teeth is in no wise caused by the pressure of the point of the permanent tooth; whether this is so, I am unable to say, but I will state this: that when a permanent tooth takes a direct perpendicular course, and impinges upon the point of the deciduous tooth, we find that the root of the deciduous tooth is absorbed away; when it takes an anterior direction, we find simply the anterior point of the deciduous tooth absorbed away; when it takes a posterior course, we find the posterior portion of the root absorbed. We find also occasional cases where the temporary canine teeth remain for years, the permanent canine tooth taking its place by its side, and no absorption occuring. It has always seemed to me that the permanent teeth did, in some manner, assist in bringing about the absorption of the deciduous teeth.

DR. ATKINSON: I do not think Dr. Francis meant to be understood as saying that when the impingement was upon the point of the root, that absorption takes place at the point. It never takes place at the point though it may take place a little to the one side or the other. If it ever does take place on the point, it cuts off the supply to the pulp of the deciduous tooth, and that is the end of the absorption. Now, when the fang does not absorb, it is chemically destroyed—never mechanically, never vitally destroyed.

DR. MORGAN: I am gratified to hear Dr. Atkinson take that position. It is not long since he gave me a sharp reprimand for taking the same position. I insisted that absorption was a physiological action, and that when devitalization had taken place this process was discontinued. There is something in the pressure of a coming body which is always necessary to the absorption of the roots of the teeth. I am satisfied that you will find in the

case of supernumerary teeth coming against roots which are developed late, that it will cause them to absorb more or less, and sometimes cause the loss of one entire root of a tooth that has more than one root. The discrepancy between the observations in this country, and the observations in other countries, long since attracted my attention. Such differences may be due to climatic influences. We all know that as we go southward, and approach the equator, there is a more rapid development than in more northern climates, and we read of maternity at ten or eleven. I once knew of twenty-eight permanent teeth being erupted at the age of eight years.

Dr. Abbott: This is to me an extremely interesting subject. We have all seen cases similar to that cited by Dr. Morgan. I had one identical in condition with the one spoken of by him. I saw the patient not more than two months ago; the teeth were in a good condition—better than the average.

In regard to the absorption of the roots of teeth, it has seemed to me that we have, instead of pressure, what might be called a physiological action taking place constantly, which produces an absorption of the roots of the tooth. That the material absorbed is taken up, as some writers assert, and applied to the formation of the next tooth, I have my doubts. It has always seemed to me that the process is the result of physiological irritation, and whether it occurs at the point of the root or elsewhere, the result is the same—absorption of the tooth. There is always space sufficient between the temporary and permanent tooth for a considerable quantity of pulp-like substance, and I have never known sufficient pressure upon the end of the tooth to destroy the pulp. In regard to the absorption of the roots of teeth where the pulps are dead; in some instances I have seen cases where I thought absorption had taken place. I have a case on hand which I am watching with some interest—a child, two or two years and a half old, which fell against a chair, injuring the central incisor, and causing the death of the pulp. I want to observe whether there is any absorption taking place; there could not have been much, if any, at the time the pulp was destroyed, and it will be interesting to ascertain if any takes place afterward.

Dr. Kingsbury: I think, with Dr. Atkinson, that absorption in the roots of deciduous teeth never takes place after the pulp is devitalized. So far as my own observation has extended, I am fully satisfied that the root of a tooth is never absorbed when the pulp is devitalized, and I think the presence of the carneous tissue, in connection with the root, is a necessary condition of absorption.

There is another point: Whatever may be the immediate cause of the absorption of the roots of the deciduous teeth, the permanent teeth do certainly seem to bear an important relation to that physiological action. In a

great many cases of retarded dentition, we find that the roots of the superior deciduous cuspidati remain in the jaw unimpaired or unabsorbed, to mature life. In such cases, doubtless, the germs of the permanent teeth are wanting, and the reason why the roots of the deciduous teeth, in such cases, are not absorbed, is in consequence of that relation which the development of the permanent tooth bears to its predecessors.

DR. FLAGG: I had supposed it long since settled that absorption is a vital process, and I always supposed that if a tooth be devitalized, the process of absorption would necessarily stop. There might possibly, for a limited space of time, be an absorption of the outer portion of the root; but such microscopical forces are hardly to be considered.

I consider this carneous body a concomitant with absorption. I do not believe absorption is ever carried on without the presence of this concomitant carneous body.

Whether it is a necessary element in that process, or whether absorption does not tend rather to produce the carneous body, are questions which I have no means of determining. If there is not vitality in the tooth membrane, it would simply be disintegration. If the pulp of a tooth is devitalized, true absorption can not take place in the tissue; there may still be a breaking down of the structure, but that breaking down is not in consequence of absorption, but is due to other causes. Now the roots of deciduous teeth, after the pulp is dead, disintegrate at a slow rate. They are, in such cases, shed by actual pressure from the coming tooth, and we find no intervening carneous body. We find the tooth coming out frequently with its roots absolutely astride of the crown of the tooth behind it.

In regard to this idea of the absorption of the temporary cuspids, it has been my misfortune to have brought to my notice several very serious mistakes, one of which opened my eyes in regard to the matter.

My practice has been to keep in place the temporary cuspids until such time as they are so loose as to become an annoyance, because, if in consequence of the usual indications of the eruption of the permanent tooth, such as swelling of the gums, etc., the temporary cuspid is extracted, it may prove a very premature act, and the permanent cuspid may not erupt for years.

In regard to the relative time of the eruption of the teeth in Europe and America, I believe Prof. McQuillen states the time in England for the eruption of the six-year old molars to be from five to seven years. That, it seems to me, is not different from the time at which they erupt here.

Indeed, I do not see the practical bearing of the facts which have been presented, relative to these differences in dental development. That certain teeth should erupt in some countries at ten years of age, and in others

at six or eight, is no more strange than that maternity should be attained at seventeen or eighteen years of age in one country, and be equally normal at eleven or twelve years of age in other countries. As a nation, we are precocious, and it is not at all strange that our teeth should share in the general precocity of development. But, at the same time, it is highly desirable that the dental student should have an accurate knowledge of the development of the teeth, in order to form rational opinions on cases of irregularity.

DR. BUTLER: Dr. Francis, I believe, said that the roots of permanent teeth were absorbed. I believe that to be so. Dr. Atkinson spoke of certain peculiarities of the teeth being derived from one side of the house, and others from the other side, and said that they furnished indications of the longevity of the individual. I have in mind the case of a boy belonging to a family, where on the mother's side, they are all dying of consumption, while on the other side they are quite robust. When the lad was about twelve years of age, a cuspid tooth began to make its appearance, the point of the crown turning to the right, over the anterior portion of the root of the left lateral, perhaps one-fourth the way down from the apex, the pressure coming across the root in that position; the lateral soon began to grow loose, and continued to grow looser and looser. After a while there was an abscess formed, when, taking the lateral out, it was found that there was quite a channel cut across it. Here was a case of absorption from pressure, a channel being cut quite across the root.

DR. MCQUILLEN: I desire to say, in response to my friend Atkinson, that the subject which I presented was distinctly limited to the eruption of the deciduous and permanent teeth. The reference which I made to the absorption of the teeth was in the most incidental manner possible, and I do not think any one who listened to me attentively, could have understood me as saying emphatically and distinctly that the carneous body does not absorb the teeth—that pressure does not absorb teeth, and that it is a case of retrograde metamorphosis. I said I had reason to believe that a carneous body is not necessarily the agent, and that it is reasonable to infer that it is not affected through pressure, but through retrograde metamorphosis. I trust I have been too long engaged in the study of physiology to indulge in anything like dogmatism on this subject.

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VOLUNTEER PAPER

ON

DENTAL PATHOLOGY & SURGERY.

By W. N. MORRISON.

In a recent number of the "Cosmos," is the report of an operation by Dr. Garrettson, for the removal of a section of the inferior dental nerve. Without commenting on the operation, I wish, briefly, to give a little experience in similar ones.

About three years ago, Dr. Hodgen, a surgeon of St. Louis, called at my office, requesting the loan of some heavy cutting excavators and chisels, to enable him to perform such an operation. I told him I thought the old operation was unnecessarily severe and formidable, and that with the assistance of a drill and burs in the dental engine, it could be equally well done and leave no external wound. I accordingly made a drill about one and a quarter inches long with a thin blade that would bore a hole about three-sixteenths of an inch in diameter; also a coarse-cut round bur, about the same length, and one-quarter of an inch in diameter, and with the engine went to the patient's residence. She was an old lady, nearly seventy years of age, and toothless; had suffered with intense neuralgic pain for twelve years. A hole was drilled, corresponding in position and direction to the place where the third molar stood, the hole being carried downwards and outwards until the inferior dental nerve-canal was reached, when it was enlarged by the bur, and as much of the nerve destroyed as could be, by passing the bur anteriorly and posteriorly in the canal fully half an inch. When it is desirable to remove a section an inch or more in length, another hole can be bored the proper distance forward of the first, and of course

there will be no pain, as the nerve is severed by the first operation. The section can be removed through the anterior hole by an untempered hook-shaped instrument. This operation, often very severe, can be performed through an opening not larger than that resulting from the extraction of a bicuspid. This, in the case referred to, secured complete relief. These cases are rarely presented to the dentist, though he is better qualified than a surgeon to treat them, being accustomed to operations in the mouth. A number of similar operations, performed at different times since, have resulted in perfect success.

REPORT OF THE

COMMITTEE ON DENTAL PATHOLOGY.

BY J. FOSTER FLAGG, CHAIRMAN.

Mr. President and members of the American Dental Association: It is with no intention of presenting a lengthy report upon the subject of dental pathology, that I rise to represent this committee upon this occasion. Not but that we fully recognize the importance of the branch intrusted to us; not but that we well appreciate the advance already indicated as the reward of thought and labor; but, that we feel, as yet, far more the need of other things than simply recapitulating the varied and opposed experience of many men, in many things, for many years.

At Cleveland, some fourteen years ago, the question was quite pertinently, asked, "what have we worthy to be called dental pathology?" And still the query seems unanswered, for even yet, so much discrepancy exists, such diverse views are entertained, and such inexplicable difference of results is reported, that the "best men," (as they are invidiously termed,) are found upon our floor arrayed as foes, and lesser lights must fain content to grope in darkness.

Now this ought not to be—for what is truth is truth—and what is false is false. That which is true, cannot be false, and that which is false, cannot be true.

It has therefore seemed to us as most appropriate, that our Centennial suggestion should point to a new departure, which, before another hundred years, might tend to unify the views of all, in relation to mooted points of daily practice, and thus establish a firm foundation upon which to rear the future pathology of dentistry.

As we discuss with fellow practitioners, the views of constantly recurring conditions; as we hear enunciated, with the force of firm conviction, ideas

diametrically antagonistic; as we read, in our several journals, actually consecutive articles, each bearing a signature we would delight to honor; each giving ample evidence of thought, of earnestness and of experience; each advocating views condemned by others, and deprecating in no measured terms, the practices extolled by some, we feel the more inclined to urge upon this body, that such action should be promptly taken as would tend to stay this seeming utter waste of energy.

It seems to us that all these workers still should work: that ardor should not cool, nor zeal be moderated; but that some means should be devised by which the danger of *losing sight of truth, in sight of self*, may more be overcome, and ways be offered that shall end in cheerful gifts of individual effort to a general fund, from which such solid rules might be deduced as would result in most extended individual benefit.

We are aware that history repeats itself; and thus we hesitate the less to urge again the value of statistics and committees; but this we beg to offer only as "suggestive," and yet, we cannot but suggest that much might well be done by means of these invaluable agencies.

We are equally aware of the oft-times sad results which follow the appointment of committees, but we must be permitted to present the view, that in all matters of such moment, it might be well to organize those analogues to committees which are termed "sections," which are not only possessed of the permanence of standing committees, but which are endowed with that vitality which springs from an almost equal permanence of membership.

It has not been overlooked by us, that in years past, the errors of individualities have been engrafted upon even these hard working and wonderfully productive adjuncts to "association" effort, but it has been our pleasure to note that the spirit of investigation and the growing desire for *truth* seem to be rapidly proclaiming themselves as the legitimate offspring of general education.

Upon this is based our hope that something worthy of our loved profession may eventuate from years of patient labor on the part of a well organized "section of pathology." Upon this is based the firm conviction that, perhaps, more than in any other way, may such result accrue as will tend to elevate our calling in the scale of usefulness to suffering humanity.

Surely there is need for this; much as has been done, there is room for plenteous increase; great as has been our advance, the path which we have trodden is as nothing to that which we may hope to tread; vast as is the amount of pain which we can now assuage, it may be rendered vastly more.

But with all this, it seems to us, as though the time had come, when, *if it be possible*, all our pathological differences should be reconciled; as a pro-

fession. we are at wide difference upon many points—far too many for our own, or for our patient's good—and this we would have rectified.

To this end we ask for the adoption of our report; to this end we trust that it may be instrumental in working much good, and most sincerely such we shall hope, will be the tendency of our suggestion.

That it may benefit each and every one of us, and, through us, vast numbers of our fellow-creatures, is the earnest desire of your committee.

[The suggestions of this report were acted upon, and a committee on "sections" appointed to consider the matter. See pp. 14 and 20. SEC.]

DISCUSSIONS.

DR. SHEPARD (Boston): I have been interested in the operations of Prof, Goodwillie, of New York, in connection with this subject. He has performed a number of operations by means of what he calls a multiple knife, which is a kind of bur. Some of these burs are an inch in diameter, and from that down: each cutting edge is made very sharp. The engine is also of a peculiar construction; it has a large driving wheel, so that a velocity of two thousand revolutions per minute is attained. In this way he can cut into osseous tissue with perfect ease. It is particularly useful in removing necrosed bone. In one case a patient had been afflicted with necrosis of the vomer; there was a small opening through the hard palate, and he removed the vomer without any enlargement of that small opening, passing this multiple knife through an opening about one-third of an inch in diameter. Knowing the anatomy of the part, he is enabled to remove just as little or as much of the bone as he thinks necessary to the success of the operation. I think there is, in this instrument, in the hands of a surgeon, a great field open for improved surgical operations.

Another operation of Prof. Goodwillie's, was the removal of a large osseous tumor, which made a large bunch upon the face; he removed it without any external opening—simply by the same means—through a little opening to admit the bur, securing a result which was an extermination of the disease, and a restoration of the contour of the face.

DR BARKER: I cannot see what is to be gained by the use of the instrument as indicated. Every one who has had any experience in surgery knows that one of the first things to be avoided is the use of any irritant. I do not understand exactly the operation of these instruments, but I cannot possibly conceive how such a bur can be used without leaving a consider-

able amount of material in the cavity, so as to give rise to irritation. It is nothing more nor less than an instrument for cutting away certain portions of dead tissue, which must be exposed, not to the external view of the person standing by, but brought to the touch of the surgeon who operates. There are cases of superficial wounds, capable of being cleansed, where, I presume, this instrument may be used advantageously, but in a deep-seated wound I cannot see how this can be done.

DR. FLAGG: I think Dr. Barker's objection to this instrument is hardly well taken; he admits that he does not understand the use of the instrument, and upon that admission he is hardly entitled to set up as a critic upon its merits. I think we have in this something destined to work a great revolution in surgery. I have found that in excavating such cavities as we are in the habit of doing about the jaws, inside the face, I can make large cuts and deep incisions much better with a rapidly revolving intstrument. Only yesterday morning I was operating for a patient of an exceedingly nervo-bilious temperament, with very sensitive dentine. I put three cells of a battery on my instrument, and got up two thousand revolutions a minute; then I used a small seven-bladed bur, and in almost no time I had cut in pieces the whole mass of sensitive dentine. I would say in regard to a driving.wheel that it is quite a valuable adjunct. If we have a motor to use with our engine, it will be found of great advantage; it is very little trouble or annoyance, and gives us a steadiness of motion which no one can get with the feet.

DR. JOHN ALLEN: In connection with this subject I wish to refer to a case that I had some six or eight months since. A gentleman, some forty-five years of age had been suffering much from neuralgia, having consulted several physicians to no purpose. The optic nerve at length became so affected that he lost his sight almost entirely. He came to me, and asked if I remembered operating upon his teeth some years previously, and my telling him at that time that he would have a wisdom-tooth come through at some future time from the lower jaw. I had forgotton the circumstance entirely. He then said, "I think that tooth is coming through." I examined the jaw, and found it was indeed making its appearance. Upon my advising it, he consented to have the tooth removed, and I accordingly extracted it. After the removal of the tooth, the jaws continued for a time as they had been before, very stiff, so that it was difficult for him to open them; gradually, however, they got better; his sight also improved, and finally he got so that he could see quite well. The whole difficulty here, in my opinion, resulted from cutting that wisdom tooth. The inflammation produced in the maxillary process by sympathy, was extended to the optic nerve, inducing partial loss of sight.

DR. REHWINKEL: I have been in the habit of using a trephine as a kind of last resort in cases of alveolar abscess, where it was simply a matter of choice between this and the removal of the tooth, and cutting off the apex of the root. I have used a trephine with the engine, and also with hand power, which I prefer in such cases, for the reason that one can operate with much greater precision and certainty in that way, knowing exactly when and where you have struck the root. I can operate much more rapidly however, with the engine, and I do not know whether it makes any great difference we go a little beyond the point into the maxillary bone or not. I have performed the operation several times with perfect success, and I think it is preferable to extraction and replantation, and it saves the patient all the pain and inconvenience attending that operation. Then, again, in excisions of the maxillary bone for tumors, I think a circular saw, with proper protection to the cheek, might be used very advantageously. Surgeons even to this day recommend bone-forceps for cutting transverse sections of the alveolar process. That is an operation which I never could approve. It always seemed to me barbarous to crush the bone with a pair of cutting forceps. I should always prefer to have it cut with a circular saw.

DR. I. KNAPP: In regard to the eye being occasionally implicated by sympathy, in diseases having their seat in the teeth, I have a case which may not be without interest. A gentleman called upon me not long since with a severe inflammation of the left eye, and in speaking of it he told me that there seemed to be an intimate connection between that eye and the first superior molar; upon examination I found that the external roots were much exposed and covered with tartar. We made, as we thought, a thorough cleansing of these two roots, but the patient came back each time with the trouble in his eye much aggravated. I was sure that there was still tartar upon the roots of the teeth, from their roughness when I passed an instrument up. I therefore slit the gums up completely, and made an effort to entirely remove the tartar from the roots. After doing the best I could, and making an application of aromatic sulphuric acid, I dismissed the patient. He did not return, as he promised, and I did not see him for some two weeks, when I met him on the street. He said the last effort was effectual, his eye having got well. The conclusion I arrived at was that the tartar had gone on until it reached the foramen, affecting the nerve communicating with the eye.

DR. ABBOTT: I have recently had quite an interesting case to treat. A gentleman was sent to me by a prominent physician of New York with what was supposed to be a very severe abscess, resulting from the death of the lateral incisor, canine and bicuspid teeth. I examined the case and

found that there was dead bone there, considerable of which I could remove easily. I removed some of it, and gave him a diagnosis of his case. I then removed the anterior plate from the central, lateral and canine on the right side, and beyond that over the bicuspids it was sound. Some days after this I examined the apex of the bicuspid, which I found was stuck up into an open cavity a little over an eighth of an inch in size, and I found two pieces of bone, as large as the end of my finger, which had exfoliated, and which I removed. This, however, did not help the case much. Upon a further examination, I discovered what appeared to be dead bone in the right nostril. I accordingly inserted my instruments into that nostril, and succeeded in removing the bone entirely. Then I went on applying a weak solution of carbolic acid, and the case, when I saw it last, was nearly well.

DR. STELLWAGEN: It may not be in order to introduce the subject of veterinary surgery here, but I have a somewhat interesting case in that line which I would like to relate; a case, which, so far as I could trace it, seemed due to an alveolar abscess about the root of a horse's tooth. The singular part of it was that the abscess had broken upon the nose of the horse, about midway between the nostril and the eye, working its way upward through numerous layers of bone in a direction entirely contrary to that which we usually see pursued in such cases. We succeeded in taking out one or two of the animal's teeth, which allowed the abscess to discharge into the mouth, and the case was then very shortly cured.

What I rose particularly to call attention to, however, is something that I do not remember to have heard brought up as yet. I allude to meterological conditions, or atmospheric conditions, as pathological agencies. Although I have been for some time accustomed to observe barometrical conditions and changes, yet my attention has been particularly called to this within the past two or three days, when I have had two or three quite severe cases of neuralgia, which I think are due to such conditions.

I would like to ask gentlemen present if they have observed that the destruction of a pulp, or the capping of a pulp, is very frequently accompanied by unusual neuralgic pains,—reflex pains,—pains attributed to other teeth or other parts of the system. There are some wonderful cases on record where an exposed pulp has produced neuralgia in the arm, in the trunk, and in the head. From a series of operations which were made and recorded, together with a series of observations of meteorological conditions of the atmosphere, at the Penn. hospital in this city, a paper was written, wherein we find the following deduction: that in surgical operations, success was more rare with a falling barometer than with a rising one. This is logical, for under a falling barometer we are necessarily losing tonicity, but with a rising barometer, tonicity is being improved. I would like to know if this agrees with the experience of gentlemen present.

DR. BOGUE: Just in that connection I would like to ask Prof. Stellwagen whether he has noticed a fact which has been remarked by several gentlemen, viz.: that during the prevalence of the extreme warm weather of this season, there were more abscesses on hand for treatment than usual during the summer season?

DR. STELLWAGEN: I did notice it. It was markedly the case. During the past winter I likewise noticed a very curious case. A gentleman in the early part of the autumn placed himself under my care, and I filled a number of teeth for him. In the latter part of the fall, or early in the winter, he was attacked by typhoid fever, and when very ill in bed sent for me. I found, upon an examination, that the pulp of one of the teeth which I had filled had succumbed, in part, perhaps, under the irritation produced by the filling I had introduced, together with the low state of his system. I treated it with simple dressings, and allowed the tooth to remain. A few days afterward I was again sent for, the patient complaining of neuralgia on the other side of the head. I examined and found a filling which had been put in some time before. I drilled through that, and found the pulp affected, as in the other case. This was to me a very instructive case; it showed me how dependent is the whole dental arrangement upon the general system. This gentleman's tonicity—his vitality—was lowered by his typhoid condition, and, as a consequence, his teeth began to give him trouble. Now, anything that lowers the tonicity of the system produces a like result, and therefore it is that there is such a marked increase of abscesses, etc., during extremely hot weather.

DR. MORGAN: In the locality in which I reside, about one-third of the population pay very little attention to the teeth, and they have, constitutionally, badly organized dentures. I have been accustomed to notice the effect of changes in the barometrical and thermometrical condition of the atmosphere upon the teeth of this class. June I found to be the worst month in the whole year for tooth-ache. I find a sudden change from cold to warm weather to be attended by much greater effect upon the teeth than a change from warm to coid, and this, I think, is owing to the relaxing effect upon the general system, of such a change. Warm weather, with a very low barometer and a humied atmosphere, appear to be very productive of dental troubles.

DR. BARKER: I think we are too much in the habit of taking a superficial view of such a subject as this. Instead of the increase of dental complaints being attributable to the weather as the direct result of meteorological influences, I think that they are more the result of changes in the habits of the individual. During the summer season, large numbers of our

patients leave the city for the country. In doing this, they make an entire change in their habits, and a deleterious change; they eat what country people would not think of eating; they sit out at night under the trees upon the damp ground. All this tends to induce systemic disturbance, and that disturbance is as liable to affect the teeth as any other part of the system. I do not consider that changes of temperature, *per se*, have much to do with it. At the same time, I recognize the fact that a person in a weak and debilitated condition, is in such a condition, that almost any irritant—almost any departure from normality, will produce these results.

DR. HARLAN: I have myself noticed the preponderance of disease of the tooth pulp, and the frequency of abscesses during the heated term, and I have also noticed a fact which Dr. Barker loses sight of, viz: that such diseases attack people indiscriminately, and without regard to their general health. I believe that the lower classes of people, as a general rule, have about as good health as the upper classes, and that it is not on account of a low state of health that there is such a prevalence of dental diseases among them.

DR. FLAGG: The very reason why I urged the adoption of the suggestion which I made in regard to sections was, in order that we might, with the greater facility, get at correct statistics in regard to subjects of this kind. I have a tabulated experience of some fifteen years in regard to this matter of exposed pulps, alveolar abscesses, etc. According to those tables, I find that March has been, by three to one, the worst month I have had for alveolar abscesses, while in November I have had twice as many as in any other month except March. This year, to be sure, has been a very exceptional year. We have had an exceedingly troublesome winter—an antagonizing, devitalizing, enervating winter, and last March was a wonderful March for alveolar abscesses. In my practice in March last, they numbered hundreds. Now I have my tables in this direction, and I would like to have them either refuted or confirmed. The month of June past has been an exceedingly bad month, and I lost more pulps capped during that month than ever before. Such an increase I attribute to the fact of its being the Centennial year, and the influx of relatives and centennial visitors, which has compelled our citizens to remain at home during the heat of the summer and endure the enervating and relaxing influences of this exceptionally trying season in the city. The same marked increase in affections of the lungs—the marked increase in cases of general debility, which is observable in the spring, is equally noticable in diseases of the teeth. The teeth are almost the first organs to give evidence of a lowered condition of the system. When a man overworks himself, before he is aware of it otherwise, his teeth begin to give marked evidence of it. In a typhoid condition of the system, for instance

the teeth and hair are the first things to be affected. Patients think it is the medicine they take that has this effect, but it is not so. It is due to the disease, and not to the action of the medicines.

DR. REHWINKEL: I am much gratified to see from the course of the discussion that we are beginning to be willing to acknowledge our failures. We are beginning to recognize that success in dental operations depends upon a variety of conditions outside of any special mode of operating. There is a great variety of outside influences which must be allowed to modify the treatment of a case in order to secure success, and these various conditions account for the difference in the views of men equally eminent, in reference to the treatment to be pursued in given cases. It is of no special importance what the teeth are filled with, provided the filling is adapted to the tooth structure and the surrounding influences,—the climatic conditions affecting the case. Persons get up here and tell us that they are in the habit of removing the nerve of a tooth, and filling it immediately. They may be able to do so in the locality in which they practice, while in other localities it may be utterly impossible.

Dr. Barker has alluded to individual habits as being more frequently than anything else a predisposing cause of dental disease. There is much truth in that, yet I contend that that statement does not apply with any greater force to the country than to the city. There is as much imprudence in the way of exposure, and as bad results from it in the city as in the country.

DR. BARKER: There are some statements which have been made here with which I cannot agree. I cannot, for instance, agree with the statement that when a man over-works, the first evidence of it will be in his teeth. That is something entirely opposed to good physiology and good pathology, and for this reason: it is a well-known law that the organ which responds first to over-work is that organ which is most highly organized—the brain.

There is no reason for taking typhoid fever as a sequence of decay of the teeth, and a low state of the system. Not a living man can look at a man and say "in one week's time you will have the typhoid fever," but as a sequence of disease and mal-nutrition, decay of the teeth results, and very justly, because the teeth being lower, respond to mal-nutrition and other debilitating influences.

DR. TAFT: I am happy to see this discussion taking so wide a range, embracing the whole range of pathology, and covering a field which we are not much accustomed to discuss. All that Prof. Stellwagen has said in reference to barometrical and thermometrical conditions is true in every

respect. It is certain that under a light or heavy atmospheric pressure, the system is modified. The air taken in in a rarified condition will necessarily produce a different effect from that taken in in a dense condition. In a rarified condition of the atmosphere, it requires much greater effort of respiration to get the same support from the atmosphere. Not only this, but a moist condition of the atmosphere has much to do with the condition of the system. This moist condition of the atmosphere is very easily understood. It loads the air taken into the lungs, and hinders the proper action of those organs. Then again it acts on the whole surface of the body, and arrests the exhalations from the surface, and the elimination of debris, which should be thrown off through the surface of the body, and so far as it has that effect of course it interferes with the functional actions of the system. The excessive heat which has been spoken of, sometimes rising to the point of blood heat, is very debilitating to the system, and in a way which I can hardly understand. There is another atmospheric element which has not been spoken of, which I am satisfied has a marked influence upon the system, viz.: the electrical condition of the atmosphere. The changes in this respect have been very frequent with us recently, and I know, both from experience and observation, that they exercise a great influence upon the animal economy. I have for four or five years had in my office an aquarium, in which I have kept fish, and in a number of instances I have had several of these fish die immediately after a thunder storm, owing, I presume, to the sudden change in the electrical condition of the atmosphere.

REPORT OF THE

COMMITTEE ON OPERATIVE DENTISTRY.

BY FRANK ABBOTT, CHAIRMAN.

Mr. President and Gentlemen of the American Dental association: This being the Centennial year of our national existence—this the city in which that existence was first proclaimed to the world, and this the Centennial year meeting of our association, it would seem right and proper that the progress which has been made during that period in "operative dentistry" should be noted at this time. Your committee has therefore concluded, that a report embracing the views expressed, and the practical ideas advanced, by the leading men in the profession, during that period, (or rather a faint outline of them), would be interesting and possibly instructive to some present.

In order that we might make our report extend back the requisite time it has been found necessary to make quotations from the writings of some outside of our own country. As at that remote period in our history ("a hundred years ago") there were no established dentists here, none at all events, whose ideas have come to us, either in print or in any other manner known to your committee. Our first quotation will therefore be made from the writing of the gentleman whom we have been taught to consider the father of modern dental surgery, whose works appear in the English language, viz.: John Hunter, F. R. S. His work entitled, "The Natural History of the Human Teeth," was published in London in the year 1778. Under the general heading of "Diseases of the Teeth," and the special heading of "The Decay of the Teeth arising from Rottenness," after giving his views as to causes and effects, he says: "I come now to the prevention and cure of this disease. The first thing to be considered is the cure of the decaying state of the tooth, or rather the means of preventing the farther pro-

gress of the decay; and more especially before it hath reached the cavity, whereby the tooth may be in some degree preserved; the consequent pain and inflammation commonly called tooth-ache avoided, and often the consequent abscesses, called gum boil. I believe, however, that no such means of absolute prevention are as yet known. The progress of the disease in some cases, appears to have been retarded by removing that part which is already decayed; but experience shows that there is but little dependence upon this practice. I have known cases where the black spot having been filed off, and scooped entirely out, the decay has stopped for many years. This practice is supposed to prevent at least any effect that the part already rotten may have upon the sounder parts. However, if this is all the good that arises from this practice, I believe in most cases it might as well be omitted. Even if it were an effectual practice, it could not be an universal one; for it is not always in the power of the operator to remove this decayed part, either on account of its situation, or on account of its having made too great a progress before it is discovered. When it is on the basis of a grinder, or on the posterior side of its neck, it can scarcely be reached. It becomes also impracticable when the disease is still allowed to go on, and the cavity becomes exposed, so that the patient is now liable to all the consequences already described, and the tooth is making haste towards a total decay; in such a case, if the decay be not too far advanced, that is, if it be not rendered useless simply as a tooth, I would advise that it be extracted, then immediately *boiled*, with a view to make it perfectly clean, and also destroy any life there may be in the tooth, and then that it be restored to the socket. This will prevent any farther decay of the tooth, as it is now dead, and not to be acted upon by any disease, but can only suffer chemically."

Again he says: "When there is no other symptoms except pain in the tooth, we have many modes of treatment recommended, which can only be temporary in their effects; these act by derivation, or stimulus applied to some other part of the body, thus to burn the ear by hot irons, has sometimes been successful practice, and has relieved the tooth-ache. Some stimulating medicine, as spirits of lavender, snuffed up into the nose, will often carry off the pain."

Under the heading of "Stopping of the Teeth," he says: "If the destruction of the life of the tooth, either by drawing and restoring it again, or by actual or potential cauteries, has not been effected, and only the cure of the inflammation has been attempted, another method of preventing inflammation is to be followed, which is to allow as little stimulus to take place as possible. The cavity of the tooth not being capable of taking this alarm like most other cavities in the body, and of course, not suppurating; often no more is necessary either to prevent the inflammation from taking place altogether, or extending farther than to exclude all extraneous irritating

matter; therefore the stopping up the cavity, becomes in many places, the means of preventing future attacks of the inflammation, and often retards even the progress of the disease, that is, the further decay of the teeth, so that many people go on for years thus afflicted; but it is a method which must be put in practice early, otherwise it cannot be continued long, for if the disease has done considerable damage to the inside of the tooth, so as to have weakened it much, the whole body of the tooth most probably will soon give way in mastication, therefore, under such circumstances, the patient must be cautioned not to make too free with his tooth in eating."

"Gold and lead (he says) are the metals generally made use of for stopping teeth. Gold being less pliable, must be used in the leaf. Lead is so soft in any form, as to take on any shape, by a very small force. Stuffing the hollow tooth with wax, galbanum, &c., can be but of very little service, as it is in most cases impossible to confine these substances, or preserve them from being soon worn away. However, they have their uses, as it is a practice which the patients themselves can safely put in execution."

"It often happens from neglect, and much oftener in spite of all the means that can be used, that the tooth becomes so hollow as to give way, whereby the passage becomes too large to keep in any of the above mentioned substances; however, in this case, it sometimes happens that a considerable part of the body of the tooth will still stand, and then a small hole may be drilled through this part, and after the cavity hath been well stopped, a small peg may be put into the hole, so as to keep in the lead, gold, &c.; but when this cannot be done, we may consider the broken tooth as entirely useless, or at least it will soon be so, and it is now open to attacks of inflammation, which the patient must either bear, or submit to have the tooth pulled out. If the first be chosen, and the repeated inflammations submitted to, a cure will be performed in time, by the stump becoming *totally dead*."

It will be plainly seen from the foregoing quotations, what was known and being done by the great men in our specialty a century back, and their progress in practice was certainly slow, judging from the following, which I quote from the work of Joseph Fox, F. R. S., published in the year 1806. Under the heading of "Filing the Teeth," he says: "In those cases of caries, where filing has been recommended to retard its progress, the most decided advantages were promised, and it is a practice defensible on the most just principles. Caries is a disease which it is not in our power entirely to arrest by any remedy whatsoever; its progress is gradual, but certain, until the destruction of the tooth is effected. The only plan that promises success, is to remove the carious part from that which is sound, with the expectation that the disease will thereby be stopped."

Under the heading of "Stopping the Teeth," he says: "In stopping the

teeth, the first thing to be done is to clean the cavity from all extraneous matter, and to wipe it out dry; then a piece of gold or tin-foil leaf is to be introduced, and carefully and firmly pressed in, so as to completely fill up the cavity, so as to allow the mouth to be closed without pressing forcibly upon it. The stopping is then to be polished, and being quite smooth, it will not be in any way offensive to the tongue."

"A decay in the central part of the teeth is the most favorable situation for retaining the stopping; when it is in the sides, or between the teeth, the pressure of the food is liable to displace it, and therefore it requires frequent renewal."

Of instruments for stopping the teeth, he says, "They consist of a hook for picking extraneous substances out of the cavity; a straight and a curved instrument for pushing the stopping into the tooth, and an instrument with a bulbous-formed end, to be used as a burnisher in polishing the surface of the stopping."

How long, may I ask, would a modern dentist be satisfied with such an array of instruments for filling teeth?

The progress of operative dental surgery during the twenty-five years following, was very material: it was no longer a question whether teeth could be saved almost indefinitely; but how to accomplish it, was the all important question to be solved by nine-tenths of those daily performing operations upon the teeth. Dr. Smith had a method, Dr. Jones another, and Dr. Brown another, but they were quite sure to keep their methods to themselves, so that the rank and file were kept in ignorance of all the new and useful ideas these men of prolific brains were constantly coming in possession of. It is true they would occasionally write very learned articles, and "show great literary talents," but the truth was well spoken by Dr. Chapin A. Harris, when, in speaking of the writings of some of these gentlemen, he says, "it is unfortunate for the profession, and painful to him who expects to find in the works of these learned dentists, something which at least will instruct him." Fine literary productions were evidently considered of greater merit than good practical ideas. However, journals began to spring up, and associations were being formed, where practical information began, slowly, it is true, but steadily, to be diffused, for which we are indebted to Drs. Harris, Parmly, Townsend, and a very few others, of the most eminent dentists at that time, in this country. A general exclusiveness, however, was the order of the day, and continued to be so for many years. The operating room was a mysterious sort of place, where no one was allowed, except the operator and one other person, (the patient,) at a time. The door of that room was closed to all who exhibited any desire to pry into its mysteries.

This condition of things however, was not long to continue, as liberal-

minded men became engaged in the profession, who seemed to delight in telling all they knew, not only with their tongues, but with their fingers, thus giving to their brethren most valuable practical, instead of the vague ideas of the tongue or pen alone. In the year 1840, I believe it was, that the "Baltimore College of Dental Surgery" first commenced its labors. This opened to the dental student the first opportunity ever presented in this or any other country, for obtaining a systematic education in his chosen specialty. I might add, perhaps with a great deal of truth, that this was the real beginning of progress in dental surgery in this country. The door which had previously been closed, was now open for clinical instruction, (the only true method of teaching operative dental surgery). Since that time there have been started, at different periods, no less than thirteen schools devoted to the teaching of young men, their system of instruction based, in a great measure, upon their clinical facilities.

We do not wish to detract in the least, from what has been accomplished by individuals or societies in this great work of progress in our specialty. But we must claim for dental colleges the lion's share of credit for disseminating the progressive ideas advanced by individuals.

In the year 1855, Dr. Wm. H. Dwinelle published his famous article on sponge or crystal gold, in which he gave the process for restoring the contour of the teeth, and the restoration of the crowns of teeth with gold, a wonderful step in advance of anything which had hitherto been done in operative dentistry. For the want of proper instruments for the manipulation of these preparations, however, those gentlemen, or many of them, who tried them, were obliged to abandon their use for some years, until, in the year 1862 (I believe it was,) Dr. Wm. H. Atkinson gave to the profession, (simultaneously with the introduction by him of the use of the mallet,) the first set of pluggers which was in any way adapted to the use of either of these preparations of gold. Since that time quite a number of gentlemen have endeavored to distinguish themselves by having sets of pluggers made in accordance with their ideas of what was needed, and I believe each succeeding set presented in one direction or another, very material advantages over any former one.

In the introduction of the mallet, above spoken of, in my judgment, Dr. Atkinson took one of the longest steps in advance yet taken by any one. You all know how many sleepless hours it has saved you, and how very hard it would be to get along without it. We can all continue to do as we have done for the last fourteen years, every time we witness the results of the working of this "little joker," thank "the giver of all good and perfect gifts," for giving us, in our day and generation, the mallet for condensing gold. With this instrument we can restore the crown of a tooth with as much ease as we could fill an ordinary cavity formerly, but in order to do it

safely and satisfactorily, we must resort to the use of another most valuable invention, "the rubber dam." This invaluable idea was given to the profession in the year 1865, I believe, by Dr. S. C. Barnnm. Previous to its introduction, however, the crowns of teeth were being restored very successfully by Drs. Arthur, Dwinelle and others, with the use of napkins only, not, however, without a great feeling of anxiety on the part of the operator, I imagine. When we were in possession of the "adhesive" qualities of gold, the mallet, and the rubber dam, we very naturally felt that we had reached the highest pinnacle possible to be reached in operative dentistry. In some respects we possibly had, for no better method for restoring the crowns of teeth has yet been introduced, nor is there any immediate prospect of any being introduced. Perhaps the one great fault of the American people is, that they are unable to ride any more than one *horse* at a time, consequently, when the beautiful "crystal gold" and "adhesive gold foil," with their wonderfully affectionate properties, were introduced, every dentist, or nearly every one, jumped from his soft foil to one of those hobbies, and attempted to ride to fame and wealth as by magic. Alas! for those who ride hobbies they are unacquainted with; disaster is quite sure to befall them. This did not prove an exception to the rule. With some, a few months were sufficient to convince them, that, for filling teeth, proper—not the restoration of the crowns of teeth—"crystal gold" and "adhesive gold foil," were "a delusion and a snare," for in many instances after teeth had been filled a few months, or perhaps a year, the patient would return, and very innocently ask what occasioned the discoloration about the fillings in their front teeth. I presume the most of you, gentlemen, know what kind of a sensation is felt by the dentist upon being interrogated in this manner, particularly if the patient shows his teeth at the same time. The question asked one's self would be,—"is that my fault?" "is it possible that those fillings were imperfectly made?" "I did that work as carefully and as thoroughly as any I ever did in my life"; "what can be the cause of it?" These and many other questions and soliloquies pass through the mind of the honest operator; facts are stubborn things, and here is one looking him in the face, saying as plainly as tongue can speak it, "these teeth are not being preserved from decay." What is to be done? What can be done? the fillings must be removed and the teeth refilled. If such a condition of things should occur in the mouth of but one patient, it might be easily accounted for, but having perhaps two or three a day for a month, refilling teeth becomes a little monotonous, and we begin to conclude that something else is at fault besides ourselves.

A little careful investigation shows us conclusively that we have attempted to ride a hobby that required some study, in order to learn how to manage, and not get thrown. Many a man, after making this discovery, quietly dismounts from his "Crystal Gold" or "Adhesive Gold Foil," and

as quietly resumes his old and familiar seat upon "Soft Foil," with which he fills teeth year after year and has no patients returning with teeth 'turning black around the fillings." At the same time, he remembers with the kindest of feelings, the gentlemen who first discovered and made known to the profession the "cohesive properties" of gold, as he is constantly being called upon to restore the crowns of teeth, which he does in the most satisfactory manner, with the most cohesive quality he can obtain.

The next innovation presented to our notice was the "Dental Engine," which I believe came into market, (and went into the mouths of patients at about the same time), in the year 1870 or 1871. Here was an instrument, or perhaps I should say machine, which was calculated to do two things. 1st. To do the work of excavating cavities, and finishing fillings much more rapidly and perfectly than it could easily be done by hand. 2d. The pain usually attending the excavating is often very much less, on account of the rapidity with which it is done; there seeming to be produced, in some instances, a condition of anæsthesia; in every case the aggregate of pain is, I believe, less. These are some (not all) of the advantages the modern dental engine presents over the ordinary hand work in the mouth. Notwithstanding, it is undoubtedly in the hands of many, a dangerous instrument. The tongue may be cut, the cheek torn, and the pulps of teeth exposed, where, if the work was done without the engine, such things would not occur. The young and inexperienced practitioner should not attempt to excavate with it, until he has thoroughly learned to handle it, in trimming fillings, polishing teeth, etc. To prevent accidents in excavating with it, a thorough knowledge of the anatomy of the teeth is absolutely essential.

There has nothing of very special interest occurred in "Operative Dentistry," in this or any other country, which has come to the notice of your committee during the past year. The days of heavy and cohesive gold, I believe, are nearly over, for filling teeth. Gentlemen in the profession have settled down to a sober, practical solution of the questions of "what preparations of gold can I best preserve teeth with, and perform the operations in the shortest time and with the least inconvenience to my patient and myself?" These are practical and very important questions to every practitioner of dental surgery, and to the community at large. Why is it that so many good dentists are idle so much of their time, and others, probably no better operators, are always busy? To me the answer is simple. The one does not study the comfort of his patient in any thing he does, while the other makes that a special study in every thing he does. If he has one, two, or a dozen teeth to fill, he performs the operation as quickly as he possibly can, and do the work well. He has a regularly systematized plan for doing every thing he finds to do in the mouth. Each instrument is adapted to certain localities, is intended for parts of certain operations, and is seldom used for any other purpose. At the first glance he has of a tooth he is

about to fill, he comprehends the entire operation, and can select all the instruments with which to perform it before touching one to it. When he begins the operation he loses no time in selecting instruments; every move he makes, whether in excavating or plugging, is one ahead. He does not allow his operations to worry him; he never gets nervous, nor out of patience with his patient; but every thing moves along rapidly and smoothly. Time is saved to the patient, which, to many, is a great consideration. Their sufferings are very much less than when the operations are performed in a slow and tedious manner. All this pleases the people, and such operators are always, or nearly always, busy.

The man who has so much time on his hands, reverses every thing; he has no system about any thing; he seems, however, to try and see how long he can take to perform his operations; he will worry an hour, perhaps, to put the rubber dam on the teeth, when the operation might be performed and kept just as dry with a small napkin, in ten minutes. His instruments are scattered about in a promiscuous sort of manner. A certain lot of them are intended for preparing cavities, and another certain lot for filling; that is as much system as he can adopt. In preparing cavities, he will pick up instrument after instrument, only to find they are too large or too small, the blade curved the wrong way, or the curve is too much or too little; so that his time is wasted to the extent of from fifty to seventy-five per cent. At the close of the day he finds that he has accomplished very little—probably not one-quarter what the systematic operator has, and has sent away what few patients he has had, with any thing but pleasant feelings toward him.

In concluding, I will simply refer to the fact, that as practitioners of a specialty, of a great and wonderfully useful profession, the necessity for a more positive prophylactic treatment of the organs committed to our charge, is becoming more and more apparent to us all. I have become so thoroughly impressed with this idea, that in the case of every patient I am called upon to treat, I recommend something to prevent the teeth from decaying. In some cases it is a more thorough cleansing; in others, in addition to that, I prescribe an alkaline solution, for rinsing the mouth on retiring at night. And in cases where the teeth decay rapidly—either from lack of good organization, or the action of mineral acids taken in medicines—I have them rinse the mouth with it four or five times a day. The results of this treatment, in many cases, have been more than gratifying, in my hands.

The solution I prescribe is as follows:

Soda Bicarb,	drms ij
Ess. Wintergreen,	aa oz. ss
" Peppermint,	
" Aniseed,	
Cochineal,	grs. vi
Aqua	q. s., Oj

SUPPLEMENTARY REPORT

ON

OPERATIVE DENTISTRY.

By A. W. HARLAN, a member of the committee.

In presenting this report, it is proper for me to say that it is only intended to be supplementary to that of the chairman, and will not, therefore, be general in its character.

During the past year, few, if any, new discoveries or applications of old principles have been made in operative dentistry. The discussions on the amalgam question are going on the country over, and it seems probable that we are soon to have a solution of the question of its fitness as a material for filling teeth. The results of experiments made by the late Dr. Hitchcock and Prof's Bogue Cutler, and Chase, although presenting very clearly some things not definitely known before, are far from proving conclusively that amalgam is even the best of the baser filling materials now in use While I do not intend to discuss this question at all, I felt it incumbent on me to notice it thus briefly, so that the later investigations of Prof. Chase in this direction might come before you for consideration in their proper place.

Deeming it superfluous on my part to mention the new aids in instruments and machinery, of whatever nature, (that being the duty of the committee on instruments and appliances), I shall endeavor, as briefly as possible to fulfil, to the best of my ability, the duty assigned me.

The practitioners of dental surgery, prior to the discovery of the cohesive property of gold, however skillful in their manipulations or faithful in their endeavors to accomplish the desired end, were able to save but a tithe of the vast numbers of teeth coming to them for treatment. This, in great measure, was because of the insufficient means at hand to prevent the

encroachment of saliva; another drawback was the non-adaptability of the form of gold used, for the great variety of cases needing treatment. A doubtful or dangerous case, if not doomed to be extracted, was then filled with an inferior material and consequently often lost in a short period of time. In fact, the conscientious operator often distrusted his ability to overcome the difficulties in the way of successful operations, on account of the possibility of his work being submerged by the fluids of the mouth. Others having no such fears, recklessly filled teeth with baser materials, regardless of their value as agents for the preservation of the teeth on account of the time saved in the performance of the operation. But a new incentive was given to the energetic dentist to excel in the style and variety of his operations, after the hitherto unsuspected cohesive property of gold had become generally known. It is true that the same, if not greater, difficulties, had to be overcome in protecting the fillings from moisture, but notwithstanding all hindrances, the ingenious operator saw at a glance that a wider field had been opened in which to exercise his talents, and vigorously commenced a new mode of practice—attempting often, in his enthusiasm, to accomplish something that should be perfectly dense and faultless in contour, without much thought of the tooth-structure he was operating upon. This, a wiser or more conservative head would not have attempted. Thus the path of progress was often obstructed, and the form of gold used was the most condemned.

With these prefatory remarks, we are brought to the subject matter of this paper. Incontestible evidence accumulates from month to month in our societies and periodicals, of a desire, on the part of many gentlemen prominent in the profession, to again resort to non-cohesive gold in filling teeth. The key-note of alarm was sounded by Mr. Thos. Fletcher a few years ago, when he stated that cohesive gold fillings were a failure, and could not, under any circumstances, be inserted so thoroughly as to prevent leakage around the margins. This was soon disproved, but the bare statement, unsupported by any evidence other than his own experiments, was accepted by many, who, having but an imperfect knowledge of the principles involved in the insertion of a cohesive gold filling, are ever ready to change, on the spur of the moment, if the slightest pretext is given them to do so. The timid but conscientious operator is ready, also, to discard as unreliable, a filling material the use of which has brought to him whatever of professional reputation he has attained to.

Having in mind the fact that a report should take cognizance of newer theories and facts in practice than are here alluded to, I have, nevertheless, felt justified in departing from the strict line of duty, recognizing the importance of any innovation, whether new or old, upon the present methods of operating. Some of the arguments advanced by the gentlemen agitating

the question of returning to a system of practice almost wholly discarded a quarter of a century ago, are:

1st. Saving of time in the performance of operations, and thereby lessening their cost to the patient. 2nd. A better preparation of the cavity. *3rd. More perfect adaptation to the margins of the cavity. 4th. Greater density of fillings, especially on the grinding surfaces. The above are the principal points of superiority claimed for non-cohesive over cohesive gold, as used at the present time.

In an attempt to evolve something of interest to you in discussing this question, I am conscious of the fact that it has been and must continue to be a subject of vital interest to dentists, even in the far distant future; for as I view it, until we have a more perfect system of prevention than is now known or practiced, we are compelled to rely on gold or something analageous to it for present use. Before attempting to point out the many advantages heretofore conceded to cohesive gold, I would like to ask why the dentist of twenty or thirty years ago, then fully aware of the various good qualities of non-cohesive gold, should have ceased using it so suddenly after a new but wholly untried property had been discovered, if it had answered all of the requirements of an universal filling material? I would like to ask further if it is not generally known that the art of mechanical dentistry had reached its highest point of perfection at about the period when cohesive gold came into general use? Is it not a fact also that the demand for artificial substitutes has decreased annually since that time, until at present we are seldom called upon to replace teeth which in those days were invariably lost? Is it not a fact also, that the teeth of our ancestors were of a better structure than are the teeth of the present generation? This is capable of demonstration by merely alluding to the system of filing then in vogue, the dentist often destroying their symmetrical appearance by making wide V-shaped separations and giving no further attention to them, while we consider it necessary to polish and repolish such surfaces time after time, to prevent the recurrence of caries. Was it because the practitioner of those days had less interest in saving teeth, and more in making substitutes; or because he was unable with the form of gold in use to make operations that should successfully withstand all agencies, whether mechanical, chemical or vital? Or because he felt that there was something lacking, and when it had been discovered, did he not desert the laboratory for the operating room; and has he not been faithful even to this day in trying to save what had formerly been lost? Now for this state of things I declare unhesitatingly that in my opinion we are indebted to Dr. Robert Arthur, the discoverer of the cohesive property of gold.

Without digressing further from the point at issue, the first question of

* *Vide* Missouri Dental Journal, April, 1876. "Cylinder fillings." C. W. Spalding, St. Louis, Mo.

saving time in the performance of operations shall receive attention. It is easy enough to dogmatically make an assertion if you are not expected to prove the truth of it, but to make an explicit answer to the above claim would require more time than is usually allotted to an essayist. Therefore, if *results* are not to be considered, I grant in part the justness of the claim, i. e., saving time in filling crown cavities; but when those are excluded from the list of operations performed with so much celerity, I pause and ask what class of cavities remaining in the mouth should, in justice to the patient, be filled with non-cohesive gold? It seems to me that there can be but one answer to the above question, when we take into account the fact that the day has come when the intelligent practitioner refuses to disfigure the teeth of his patient, so as to make an otherwise tedious or lengthy operation consume less time than should be spent, had he a regard for what is demanded of him. Practically, excepting a few small labial and proximal cavities, there is not in the mouth of a patient seeking our services, a cavity which, even though it might be filled with non-cohesive gold without serious disfigurement, should not be filled with the most cohesive gold attainable, on account of the strength required in such filling, to fulfil the object sought in placing it there. I deny without reservation the claim of saving time by using non-cohesive gold, because there can be no comparison in results, and that is what we are aiming at. With regard to lessening the cost of operations, I think that however desirable in theory, something like the following is a well known fact: where capacity, honesty and an inflexible determination to succeed, possess a man, his services are constantly increasing in value, without regard to the length of time required to perform an operation; therefore, that consideration carries little weight with it. As to the second claim—a better preparation of the cavity—I have this much to say: of the smaller cavities, the modes of preparation are essentially the same, but when the larger cavities, and those with frail walls are to be prepared, the methods of preparation for cohesive gold fillings are much superior to those for non-cohesive. Do you ask why? I answer that very often for esthetic reasons, we can spare the whole or a part of a frail anterior wall of enamel slightly supported by dentine, if we use cohesive gold, because we can build to, and over the margins, sufficiently thick layers of that form of gold, to thoroughly protect them in the event of their being cut away, while on the other hand, had an attempt been made to fill such cavities with non-cohesive gold, the walls would of necessity have to be sacrificed, the simple fact of wedging the gold into position being enough to fracture the margins of the cavity, unless they are cut away to a firm border, thus leaving wide and unsightly spaces. Now as to the third claim, "more perfect adaptation to the margins of the cavity," I deny at the outset the truthfulness of the above, for the following reasons. From my own observations during the past ten years, I am convinced that non-cohesive gold fillings on proximal surfaces, are much more liable to fail around the

margins than cohesive gold, because, as heretofore stated, the operators using non-cohesive gold—and they used to be legion—were afraid to cut enough to mar the appearance of a tooth, and the consequence was, a chipping of the margins, thus resulting in failure. Whenever they filled a crown cavity and left an overhanging border of enamel which seemed to be strong enough to withstand the force used in mastication, sooner or later, it was a complete failure, because the gold could not be packed underneath the margins so thoroughly as to support them, as was intended by the operator. Again, non-cohesive gold is very liable to flake around the margins of a cavity, unless a very great amount of force is used in condensing—greater by far than is necessary or desirable when using cohesive gold; the filling at those points will be porous, and of less use to the patient than a poorly condensed filling of cohesive gold. If any further proof of the position I have taken was wanting, I might say that the most pronounced advocates of non-cohesive gold confess that it is better to finish a filling with a few pellets or cylinders of cohesive gold, because they can obtain a denser surface, and one which will take on a better polish.* The fourth claim is, greater density of fillings, especially on the grinding surfaces. This claim of all others seems to me the weakest that could have been offered in support of any theory—for it is only a theory—when the truth or falsity of it is so easy of demonstration. The results of experiments reported to this association by Dr. George H. Cushing, at Detroit, in 1874, prove conclusively that the above is false in theory and in fact; but, granting that it were true, why is it, if such fillings are so superior in density, that we are often requested to examine the grinding surfaces of teeth for decay, when on so doing, instead of the expected new cavity, we find one of the "old-liners" of non-cohesive gold, so hollowed out by mastication, that it is no longer a protection to the cavity in which its remains are? Has any one ever seen such a state of things where cohesive gold was used in like cavities? It seems to me that the true solution of this question lies in the fact that in using a non-cohesive gold, it is impossible to make a perfectly dense filling. Assuming this to be true, when the force of mastication is brought to bear on the surface of such fillings, the interstitial spaces are filled up, causing a part of the hollowed appearance heretofore spoken of; the remainder resulting from the flakiness of the material itself; whereas on the other hand, had cohesive gold been used in such situations, the filling would have been one coherent mass, perfect in its adaptation to every part of the cavity, and doing service without apparent wear, even though it were not perfectly dense.

Now, while I am willing to accord to those giant intellects of the past great honor for what they did in their day and generation for the upbuilding of the science of operative dentistry, I am not willing to accept the

* *Vide* Missouri Dental Journal, April, 1876. "Cylinder fillings."

heritage left us and use it in modern dental practice; for the reason that something more is demanded of us. As was remarked before, the teeth of the present generation are far inferior in structure to those operated on in the past. This fact alone makes it imperatively necessary that in our operations we should as thoroughly as possible protect all surfaces of dentine and enamel, where the nature of the decay demands it. This we are unable to accomplish with non-cohesive gold. Again, I contend that in the successful use of cohesive gold, the development of the highest grade of skill is attained, the nature of that form of gold itself compelling the operator to proceed step by step until every part of the filling is completed. Instead of being a hindrance, this is a positive benefit, as it enables the operator to put to the best possible use whatever of artistic ability he may possess. Then the result attained is far superior to that by any other method. This is unquestionably true; for be it remembered, in the one case we have a perfectly coherent mass, and in the other the particles are only in apposition, and it matters not how well they were placed in position, no dependence can be placed on the strength of the filling itself; but on the contrary, the walls and margins have to sustain all of the varied requirements of mastication. We can go a little further, and say that it is folly to suppose that we must make all of our fillings thoroughly dense, for that is not needed in all cases, but that it is more desirable to make them from a form of gold which possesses the element of cohesiveness, I am firmly convinced.

In conclusion, gentlemen, understand me, I am not here as a special pleader for that most absurd of all hobbies, the perfect contouring of teeth, but I plead for that wise conservatism, which, in its fullest understanding, demands of him who practices it the perfection of good judgment.

REPLANTING AND TRANSPLANTING TEETH.

BY W. N. MORRISON.

I wish to present at this time only a few of the more interesting cases. I will preface this report by saying that all the cases reported by me to this body last year are firm in their places and doing good service, with one exception—No. 2.

Dr. Ingersoll's tooth is a failure. It was doing good service until sometime in March of this year, when he was eating some pitted cherries, and gave the tooth an unlucky jar on a stray pit. The tooth, having a large crown and a small and broken root, began to get loose, and, when I saw it last it was in a hopeless condition.

No. 41. A young lady, aged about twenty years. Left superior bicuspid, large decay in distal surface, involving pulp canal. The tooth had given trouble ever since it had been filled, at nearly every change in the weather. Having a desire to see the apex of the root, I extracted the tooth. In refilling it, the buccal wall, which was very thin, broke off, so it was finished up as a cuspid, and in replacing it in the socket, I turned the palatine wall to the buccal side of the socket.

No. 48. Wife of a prominent physician; right lower second molar; small decay on distal surface, very inconvenient of access, being under the gum, and the crown of the third molar dipping into it. First molar missing. The patient, being in a prostrated nervous condition, begged to be let off easy, so I compromised my professional dignity (or according to some, elevated it,) by filling the tooth with amalgam. Everything seemed lovely, but at the end of about the third day she came to have it extracted, which was accordingly done. Next morning she returned and had a small filling put in the mesial surface of third molar, and in the meantime the extracted tooth (whose dead pulp was the cause of all she trouble) which had been filled, roots and crown, was returned to the jaw.

No. 40. Miss Mc——, aged about twenty-two years, nervous tempera-

ment, an abundance of dark hair, dark eyes, medium height, had a right lower third molar, which had required the dentist's services from the time of its eruption. There was a large corono-buccal cavity, extending deep under the gum, which I had filled about a year previous with oxychloride; root canals at the same time. In biting some hard substance the entire remainder of the crown had given way, leaving nothing to work upon. The patient has a younger sister with a splendid set of teeth, but scarcely enough room for her third molars, so I requested her to bring this sister at her next visit and I would transplant one of her teeth to the patient's mouth. They came, and with a great deal of difficulty the roots of the broken tooth were removed—two distinct roots; the sound tooth was extracted from the sister's mouth; root vessels removed and canals filled; but as this tooth had but one large tapering root, I had to remove the septum of bone and prepare a socket for it. The tooth was transplanted to patient's jaw and the articulation was good. The patient had all manner of fears and sensations to ascribe to it for a few days, but it improved rapidly, and to-day is a splendid masticator, doing good service. Of course there was no fear of blood-poison in this case, but I have a number of cases which I am keeping filled temporarily. hoping that something may turn up by which I can get teeth to suit the cases, with little or no risk from blood-poison.

No. 56. Left lower third molar for a man about forty-five years of age; florid complexion. It had been filled with gold for years, but the cavity being shallow on one side, the filling gave way, and the tooth became sensitive to mastication, and he had an annoying ache for weeks. My first treatment was to excavate the margins of the cavity and fill with oxychloride. For several days there was an improvement, but the patient came gradually to the conclusion that he would rather be without the tooth than have the ache. Being quite positive that there was a deposit of calcific matter in the pulp, I could promise no relief without a destruction of the pulp, which in cases of this kind, gives more pain than the extraction could possibly do. The tooth was extracted and root vessels removed, when sure enough a nodule of calcific matter was found there. Roots and crown were filled, and the tooth returned to the socket. Unfortunately, I had made too much restoration to the crown, and the other teeth could not come together. It gave the patient a great deal of pain and me much trouble to get it ground down, owing to the peculiar slanting articulation with the upper ones. This was finally accomplished, and at last accounts the tooth was quite comfortable.

No. 57. A healthy young man aged about twenty years, presented himself with first and second left lower molars badly decayed; pulps dead; face much swollen and hard, and had been thus for three days. There had been similar swellings from them before. These teeth were extracted on the 21st of June, about seven o'clock p. m., and returned to their places the

22d, about nine o'clock p. m., having been out about twenty-six hours. I saw the patient on the 22d of July, and everything was in splendid shape.

There were several cases where calcification of the pulp was prognosticated, and I regard it as the least painful and most satisfactory way to treat such cases. Cases 56 and 31 were reported on page 105 March number *Missouri Journal*. I have a great many other cases of interest, but not believing in long papers, I close, thanking you for your indulgence.

DISCUSSIONS.

DR. JAS. LESLIE: I would like to make a few remarks upon the subject of the papers of Drs. Abbott and Harlan.

I desire to state that I was the first person to introduce what is known as cohesive gold to the dental profession. I discovered this peculiar property of gold in 1839. While on a visit to Louisville, Kentucky, I called the attention of Dr. H. A. Gould to it, who made a practical application of it, and succeeded in building up some very fine contour fillings. There are some individuals who do not appear to recognize the peculiar nature of gold foil. They have an idea that the harder they make the filling the denser it will be. The more you beat upon gold foil, no matter how soft it is, the harder it will become. The same force that destroys the character of gold when it is placed on an anvil, is the force which is applied in excessive malleting. It is scientifically and chemically established that just in proportion as you hammer gold, just in that proportion will it become hard. The result is weakness throughout the whole mass, and a liability to disintegration. If you take two pellets of gold and condense one thoroughly inside the tooth cavity, and then condense another to an equal degree outside, you can not bring the two into cohesion in the cavity, and for the reason that you have malleted the electric life out of the two pieces before bringing them together. If you take several leaves of gold, as they come from the gold beater, put them together and condense them, you will find that you have not extended the mass in the least. All you have done is to eliminate the air contained in the mass—merely driven the air from the interstices of the pellet. When you have done that, brought the points of gold thoroughly in contact with a certain degree of condensation, you have done all you can do to make gold solid or hard. Any malleting beyond that

tends to injure your filling. In regard to the shape of the instrument, I do not think it is necessary to use such small-pointed instruments as are generally used. Why, a blacksmith would smile at you if you told him he ought to use a small-headed instrument in welding a piece of iron. The larger the instrument he can conveniently use, the better.

DR. WETHERBEE: I would like to ask the gentleman how he reduces cohesive foil to con-cohesive foil?

DR. LESLIE: If you go into the market to-day and get me the three kinds of foil in use—cohesive foil, semi-cohesive foil, and non-cohesive foil —I will take them and put them through such a manipulation as will utterly destroy their identity, so that not one man present can tell which is the cohesive and which is the non-cohesive foil. If you take a piece of cohesive foil and put it in your drawer for several nights, upon taking it out it will be found soft, owing to the carbonic acid gas which has settled upon the surface during the night.

DR. KINGSBURY: I subscribe fully to almost all that Dr. Leslie has said. I think, however, that cohesive gold can not be as readily and perfectly adapted to the walls of a tooth cavity as non-cohesive gold. It is less ductile and pliable, and there is necessarily more rigidity about it. It has been claimed by some that gold must be chemically pure, in order to possess cohesive properties. That is not the case. I have in my possession to-day a quantity of foil made for me as much as fifteen years ago, containing a certain percentage of silver, which is as cohesive as any gold you ever saw, showing that the cohesiveness of gold is no indication of its purity. Prof. Leslie has told us how cohesive gold can be made non-cohesive, and how chemically pure non-cohesive gold can be made cohesive. I don't know as it is known to the profession generally that Abbey's non-cohesive gold foil possesses a property which no other gold foil does possess, viz: the quality of retaining its non-cohesive property under all circumstances.

DR. BARKER: It was stated to me by one of the most eminent chemists in this country, in speaking to him on the subject of gold foil, that if you take two pieces of gold leaf and place them one upon the other, so that they could be subjected to a gradual pressure of a million tons, without any shock, when the pressure was removed they would be just as separate and distinct as before.

He stated that a shock was necessary to overcome filmal resistance, while Dr. Leslie, as I understand him, states that it is not. I think, however, that we can over-mallet just as much as we can over-drink, or over-smoke.

DR. WETHERBEE: I desire first to correct, if possible, what I esteem a very erroneous theory, viz.: the calling cohesive gold hard gold. It is the softest possible condition of gold. It has obtained this character for hardness simply because, in manipulating it, one particle clings to another.

There is another point: Mr. Leslie could not understand why cohesive foil could not be as readily adapted to the walls of a cavity as soft foil. He did not think it could. Now I take issue with every man of that opinion, and I claim here, now and forever, that cohesive foil can be as readily, effectually and thoroughly adapted to the walls of any and all cavities, as any other foil. Of course it is requisite to know where to commence your filling, and how to conduct the process of filling, in order that one portion of gold shall not impinge upon another, and therefore prevent the carrying home of gold to particular points.

I make a third point: That the cervical wall of any and all cavities where the rubber dam can be used, can be as effectually and thoroughly filled with cohesive foil as with non-cohesive foil. But it is claimed that cervical wall cavities are generally the first to give out. That is true, but it is not because of the cohesive foil filling. It may depend on two causes; the filling may recede from the wall in the course of the operation, in the slightest possible degree from that point, which is sufficient to cause a failure. Then, again, by too severe malleting you are very liable to abuse the dentine, a fact which has been overlooked by hundreds of dentists. Cohesive foil does not require a great amount of malleting.

Again, it is claimed that undercuts cannot be well filled with cohesive foil. That is not so. Undercuts can be filled with cohesive foil if you have the proper instruments, handled with proper skill. I have no trouble except in a certain class of cases where the teeth are very poor.

I defy any man in this audience to demonstrate to me that soft gold is more adaptable to the walls of the cavity than cohesive foil.

DR. SHEPARD, Boston: I will accept the gentleman's challenge. I desire, also, to answer the question put by Mr. Leslie, in regard to why it is that non-cohesive foil can be more easily and perfectly adapted to the wall of a cavity than cohesive gold. Cohesion is a property possessed by the atoms of matter of uniting with each other when brought within immeasurable distances of each other. When you bring a molecule or atom of one material in such approximation to another different material, you get a union which is called adhesion—sticking to; cohesion—sticking together. When we bring together two surfaces of cohesive foil, which is a pure foil and a clean foil, there is nothing between those surfaces to prevent their union when they are brought near enough together to constitute what is called contact. The non-cohesive foil has something on its surface which presents a barrier to contact, or the union of the two molecules.

When a sheet of foil is taken on a napkin and rolled into a rope, we have a wrinkled condition of the surfaces, so that these surfaces touch at irregular points through the whole mass. If this gold is non-cohesive, these points of apparent contact are not brought into such an approximation as to enable cohesive attraction to be set up between them, and hence there is no cohesion, but the surfaces are free to move or slide one upon the other. The rope is still pliable or "soft," as some prefer to call it. This softness will remain whatever style of force we use in the manipulation, and hence its facility of adaptation to uneven surfaces during the process of consolidation.

If, on the other hand, our rope is made of freshly annealed foil, or made as above, of non-cohesive or "stale" foil (as the English call it,) and then annealed, what do we get? The barrier, whatever it is, to perfect contact is removed, union—cohesion, takes place between every one of these touching points, and there is produced throughout the entire mass, pillars, columns and arches of every size and shape, making a structure which embraces the foundation principle of architectural strength. Our pliable rope is now stiff and rigid or "hard," if you like the term, not because the gold is made any less soft by annealing, but because we have to overcome the strongest principle in nature, the arch, and break it down. To do this, if the mass is large and so there are a series of arches on arches, we must employ great force, or like the blacksmith spoken of, a large hammer and an anvil, or in other words be gold-beaters. With lighter force we get a breaking down of the arches on the upper surface and to a less extent on the lower, but we have the arched condition remaining in the center, surface consolidation or case-hardening utterly destroying that beautiful facility of adaptation which non-cohesive gold, even in large masses possesses, and also the power of welding this mass to another in the cavity. This is the philosophy of the bosh of "malleting out the electric life," and to me seems an all-sufficient explanation of what some have considered a mysterious quality of gold.

I wish we could banish the terms "hard" and "soft" gold. There are only two terms—cohesive and non-cohesive. The former is the softest gold in the world, provided you do not form it into arches and curves; the latter is always soft simply because the points of contact do not cohere in making it into a rope, a pellet, or in working it.

The practical inference is, that if we use cohesive foil, and want to carry it thoroughly against the walls of the cavity, we should use it in small masses, so that we have the minimum of these arches or curves, or use it in flat folded ribbons or use high numbers. Also if we would use large masses, let it be of the non-cohesive variety.

DR. FLAGG: With the exception of very large countour fillings in certain cases, I use generally gold foil both soft and hard, as it has been

termed. This distinction, however, is incorrect. I fill my crown cavities, as a rule, with non-cohesive foil, and I do it because my experience assures me that this is the best material for such cases. I have seen fillings of that kind which have stood unimpaired for fifteen or twenty years. Where fillings on articulating surfaces can be put in in a short space of time, and do just as good service by using soft foil, I see no reason why it should not be used.

In proximal cavities—cavities where the walls are very thin and will not bear a great amount of malleting—in such cases I use cohesive foil. By gently carrying my foil into place layer after layer, (not using heavy foil,) I can make excellent fillings in such cavities.

DR. MORGAN: I thought that the paper of my friend Abbott was somewhat inconsistent. Dr. Abbott says that, so far as he is concerned, cohesive gold is an entire failure, but when he comes to speak of the subject of contour fillings, he is enthusiastic in regard to its merits. It seems to me that that is a fatal inconsistency—a turning square about.

I will here answer my friend Kingsbury as to how non-cohesive gold may be made cohesive: simply make the surface of your gold clean and soft, and it will be cohesive. I think my friend Shepherd demonstrated that one ought never to roll cohesive foil into a rope, and ought never to use it in pellets; that it should be folded, put in in a laminated shape, so as to avoid the making of those arches.

One word in regard to the original introduction of cohesive gold. Mr. Tomes, in 1842 or '43, in a lecture before the Middlesex hospital, stated that some gentleman had recently returned from the United States and brought with him an article of cohesive gold. That was in the form of a precipitate, and he and others had attempted to use it, but with no great success. I think if you examine the old *American Journal* as early as 1845 or '46, you will find that there was at that time efforts being made in Europe to use cohesive gold. Lately, in an article on the use of gold, which I prepared for the Tennessee Dental Association, and which was the result of considerable research, I stated that no new principle has been discovered in connection with gold for the last fifty or perhaps one hundred years.

DR. STELLWAGEN: It seems that with a regularity as perfect as the movement of the planets, we come around periodically to a discussion of this mooted question of the relative merits of cohesive and non-cohesive gold. One year the balance of opinion is in favor of cohesive foil. The next year it will change, and non-cohesive foil will be in the ascendency! Now, what does this fluctuation of opinion signify? It unquestionably means that a good, serviceable filling can be made with either of these materials. It means that under certain conditions one is superior to the other.

Since 1859 I have used Abbey's foil, and I corroborate what Dr. Kingsbury says: that Abbey's non-cohesive foil cannot be made cohesive. I have found this foil to be entirely uniform. In all my experience with it I have never found but one or two leaves that were not susceptible of manipulation, and therefore its use is attended with less waste than almost any other material. The less change we make in foils, I think, the better, because in handling a certain foil we come to understand its qualities better and better, so that each filling with the same foil is an improvement on the one before. Now, in regard to using cohesive foil—one method of using it might be illustrated by the manner in which a car wheel is put upon the axle. It is put on, I believe, by hydraulic force, driving the axle into the wheel, and the greater the pressure required, the more exactly will the axle fit the car wheel. Now, there are two ways of filling a cavity with cohesive gold—welding it piece to piece, and also by putting it in in one plug, each being preferable to the other in certain cases. We are to exercise our judgment in the choice of materials and methods, and the right exercise of such judgment constitutes one of the chief elements of success in dentistry. Why, if there were but one inevitable way of operating—no scope for the exercise of skill and judgment—a Chinaman might be employed to perform dental operations.

DR. HUNT: I trust I may be pardoned for uttering a slight criticism upon the discussions of this body. That criticism is that we make assertions without giving the reasons for them, or producing statistics to prove our statements. The first paper read spoke in quite disparaging terms of cohesive gold as a filling. The second paper took the opposite ground, and instanced fillings in the grinding surfaces of molar teeth which had proved signal failures. But this proves nothing. We can all of us call to mind fillings of that class which have stood the severest tests. I think it is established by any number of cases that perfectly successful fillings are and can be made with either kind of gold; but in using these different kinds of gold their different conditions must be understood, and the manipulations studiously adapted to those conditions.

It is an undisputed fact that there is no effect without a cause. It is an equally undisputed fact that a cause will always be followed by an effect. Further, every process from every cause to its appropriate effect must take place in accordance with certain unvarying natural laws. If we lose sight of this foundation of science and philosophy in our investigations, we must go astray just to that extent. Now, how many are there who understand precisely what will be the behavior of gold in its different forms and conditions? I must confess that I do not know. We will take a cavity, for instance, and introduce into it a non-cohesive filling. We will then take another, and introduce into that a cohesive filling. Then after the gold

has been condensed in each of these cavities to the extent, we will say, suggested by Mr. Leslie, let us apply a hammer smartly. What is the behavior of the gold in the cavities respectively? We all know that by hydraulic pressure water can be made to burst the strongest iron vessel. I know if you take a cast iron cup and pour it full of lead, and take a moderate sized hammer and hammer upon the surface of that lead, you will eventually break that cast iron cup. Now, to what extent does this law apply to the action of gold in a tooth cavity? It is the object of this association to investigate these principles—all the principles which underlie the practice of our profession. Can we do this by simply making assertions? It should be our aim to investigate subjects in a spirit of scientific inquiry, thoroughly, searchingly; not presenting our conclusions until we have considered every element in the question. We cannot, in our profession, restore destroyed tooth-structure. We can replace it with a more indestructible material, and we can also, by following this process of investigation, not only do this, but we can go further back and remove the cause. We have heard fact after fact stated here, and much that has been stated has been neutralized by direct counter statements. This indicates something radically wrong in the methods of investigation of this association, as a body organized for the promotion of dental science.

In our part of the country we are deeply impressed with the necessity of conservatism in dentistry—conservatism in investigation and conservatism in the practice of dentistry.

PROF. BARKER: In regard to this subject of cohesive and non-cohesive gold, I desire to say that I have made some very careful microscopical examinations of sections of fillings of both cohesive and non-cohesive gold after thorough packing, and I have not been able to detect the slightest difference in density.

In regard to the subject of replanting and transplanting teeth, I admit that it may be done, but it is an operation attended with no small risk. I have seen a case where a patient had seven teeth extracted and re-inserted, as a last resort in the management of disease—seen them taken out on account of spiculæ of the bone, and that too of a character found only in marked gouty diathesis, with uric acid crystals standing out on the roots. I have seen them taken out in such a case, replanted with every precaution, and after a long time become firm and solid in their sockets. Then I have seen one more extracted, and seen tetanus supervene under unfavorable thermal and constitutional conditions. Few here know by actual observation what tetanus is; but he who has once seen it would perform no operation involving a risk, however slight, of inducing such an attack. He would take no risk of septic poisoning in order to preserve an organ which we can preserve by other means just as well. It is true the operation may

be performed successfully, but I consider its indiscriminate practice ill-advised. In the operation of tortion also, you are very liable to injure the alveolar process, and the injured portion may go on to degeneration, so that you have septic poisoning, tetanus, erysipelas and death.

There is another thing which I wish to bring to your attention. That is the elongation of a front tooth when broken off, instead of restoring with gold. Suppose it is a child who presents itself with a broken central incisor. I first smooth the posterior surface. Then I throw a ligature around the central incisor, and also a ligature or two ligatures, if you please, around this broken central. Now to those two ligatures upon the central incisor upon its proximal surface I tie two little thin rubber bands, which should be of a very delicate and flexible character, as what you want to obtain is a gradual pressure—extensile force. In this way the tooth is gradually elongated and brought out of its socket, down upon a perfect line with the others. Now then, as soon as this takes place, I take the burring engine and very carefully burr off the point of the tooth to a regular line.

DR. MCDONNELD: It has been remarked that there was more in the man behind the instrument than there was in the instrument or the material. In my opinion this is not entirely true. I think there is as much in the gold and the instrument used as there is in the man. There is as much in the choice of right materials as in anything else. Many an unfortunate failure has been the result of an attempt to fill teeth with gold, which were not amenable to preservation by such means. Dentists have heretofore, as a rule, been unwilling to recognize any other material than gold as a filling for teeth, but I hazard the statement, and I think I can back it up, that the most inexperienced empiric you can pick up, carrying around his box, can, under certain circumstances, fill a tooth with amalgam, so that it will last longer than the same tooth filled by the best operator you can find in the profession. Under certain circumstances I consider gold the worst material I can use in filling teeth.

I agree with Dr. Leslie in the statement that gold is destroyed by too hard malleting. I go further, and say that there have been more teeth destroyed by heavy malleting, than there have been gold plugs so destroyed. I have used the mallet, but not so extensively and severely as some have done. There are many teeth—teeth of a chalky composition and inaccessible in the mouth—which cannot be saved by the present dental skill, by the use of gold. In such cases it would save the patient much expense and suffering if the dentist would introduce, instead of gold, a good amalgam filling.

It should furthermore be the dentist's duty to give patients such instructions as to the care of their teeth as will prevent the recurrence of decay. He should furnish them with brushes, and impress upon their minds the necessity of using them regularly.

Frequently when fillings have been well inserted in the buccal surfaces of teeth, an examination afterward shows a deposit of decomposing food there, and as a result of such uncleanliness, a dissolving away of the enamel of the tooth at that point.

DR. BARKER: I want to make a few remarks in modification or explanation of some remarks I made this morning, upon the subject of the transplantation and replantation of teeth. I recognize the great difference between replantation and transplantation. Transplantation I consider under all circumstances reprehensible. Replantation is admissable and advisable under certain circumstances, in my judgment. I do not disapprove of the replantation of teeth, after accidents, for instance. I would go further, and say that sometimes in a morbid condition, extraction and replantation is advisable; always, however, recognizing the necessity of making an opening for the drainage of fluids, which otherwise may cause septic poisoning. Unless there is proper drainage, the operation is attended with danger.

Passing from that point, I desire to call attention to this matter of elongation of teeth—drawing out broken teeth so as to make them as long as their neighbors, and that, too, without destruction of the pulp. It requires for this operation considerable time, and the force applied should be exceedingly gradual. For the purpose of showing you how exceedingly careful I am, I have brought a sample of the very delicate tubing that I use—the finest French tubing. I give you here an entire diagram: A young student at the college presented himself with a supernumerary tooth, situated as many are, between the central incisors, giving an unpleasant aspect to his mouth. While it was possible for me to have built gold on that tooth upon each side, and transformed this canine in its appearance into a central incisor, yet by placing these rings as I tell you here, and gradually elongating the tooth, I drew it from its socket until I could take off its point, and get consolidation. But there is another point which I want you to recognize, and that is this: when this has been accomplished—when the tooth has been elongated—it rests entirely with the operator whether or not it will be successful. Everybody who is at all acquainted with the physiological conditions of plasma in different stages of organization, knows with what ease that plasma is absorbed. Now, it becomes necessary after a tooth has been brought down, that the motion of the tooth in its socket should be prevented. This may be effected by a delicate plate, so adjusted as to hold the tooth in its position, at the same time not preventing the normal motion of the tooth in the socket, or you may have an absorption of this, and a gradual passage of the tooth back into its old position.

There is another means by which this can be made use of and the same thing accomplished, only in a different manner, and from an entirely different pathological condition. For instance, when a tooth, instead of being

shorter, is considerably longer than its neighbor, you can apply force directly to that tooth, and push it back into its socket. I do not care if it is five or ten years after it has been in an abnormal condition. This is taking broad ground, but it can be supported by facts and good physiological explanations. You have to do the same thing that was done when the tooth was brought down. You have to be careful that consolidation takes place thoroughly before you give up the case. In other words, the tooth must be so arranged as to prevent motion in the socket until consolidation occurs. It may be remarked here that the ligature around the tooth, which serves as an attachment, may cause an elongation of that tooth also. There is, it is true, some danger both of elongation and irritation. I rely upon a ligature placed around the neck of the tooth, and I have a tube, which I will show you here, which I can place upon a tooth so that it will not cause irritation.

DR. STELLWAGEN: Dr. Barker states, as I understand him, that transplantation is never justifiable. I have a patient here which demonstrates the contrary. [The Dr. here produced a cock, with a tooth growing in its crown]. The history of our patient is as follows: Three weeks ago to-morrow a little patient came to my office for whom I found it necessary to extract a bicuspid tooth. The tooth was extracted at nine o'clock in the morning. I placed it in water, and allowed it to remain until one o'clock, when I purchased the bird which I here produce. In this connection I wish to say that there is unquestionably danger in the performance of any operation, from pathological changes. I believe that in the insertion of a gold filling, particularly when it comes down close to a pulp, there is danger of tetanus. I am well satisfied that there is danger of tetanus in capping pulps. Dr. Barker cites a case of replantation which I have always taken the ground was a justifiable case on his part. The patient in this particular instance, where he had been successful so many times before, had by a long course of fastings and religious observances, placed herself in a very abnormal pathological condition. There was a pathological condition at the ends of the roots of these teeth which was peculiar, and which in itself was sufficient, without extraction and replantation, to have produced this disease. Of course, if we confine ourselves to the lower grade of operations, we may never have any such necessity as the Doctor speaks of, but I hold that this operation is just as justifiable—far more justifiable than many surgical operations which I have seen performed before dental associations. It is justifiable because it will at times replace teeth which are invaluable to the possessor. The loss of a front tooth may seriously interfere with proper articulation—may impair one of the most important functions of the body. We continually hear of cases where ten times as severe and dangerous operations are performed, simply for the sake of appearance—not for the sake of utility. In any case where I felt that the loss of a tooth would interfere with articulate speech, I should esteem it my duty as a practitioner to replace that tooth in some way.

DR. BROCKWAY: I would like to ask the gentleman what his experience is as to the permanence of such operations? It seems to be assumed that this operation of transplantation is a permanent operation. That is contrary to my experience and observation.

DR. STELLWAGEN: My experience as to replantation is of course necessarily limited to a certain number of cases. In the Odontographic Society we had presented a tooth which had been extracted and replanted, which remained in the mouth somewhere between eighteen and twenty years. I transplanted a tooth some time ago which, the last time I saw it, seemed to be doing very satisfactory service. My experience in replantation has been uniformly successful. About the third day I usually find the soreness has passed away. The teeth I have replanted most frequently, have been the dentes sapientiæ, which, on account of the overhanging mucous membrane and gum, it was impossible to fill in consequence of the bleeding. In such cases I have frequently made replantations with perfect success, the teeth being just as serviceable for masticatory purposes as any teeth, and much more perfect than they otherwise would have been, as regards filling. Another case of transplantation was that of a bicuspid, which was crowded out of the arch of the jaw in such a manner that to have forced it into its proper position would have required a tedious and painful operation. It was extracted, and the root of a similar tooth from the mother's mouth put into the daughter's mouth, and the tooth of the daughter put into the mother's mouth. In this case, the subjects being of the same blood, of course there was no danger of the transmission of any hereditary disease, which, it is unnecessary to state, it is possible to transmit by this operation. It is an operation, of course, which demands caution on the part of the dentist; but it is not, on that account, objectionable. I have in mind now three cases reported, where transplantation resulted in symptoms of secondary syphilis. Those were cases performed some time ago, and it is probable that they were performed by men not competent to judge of the person's condition from whom the teeth were taken.

DR. AMBLER: We have had various revolutions in dentistry since I began its practice, and I have found it interesting to mark the changes of opinion which have taken place. In regard to hard and soft foil, I heartily indorse what Prof. Shepard said this morning in regard to the difference between them, and the difference which should be observed in their use.

As to transplanting teeth, I desire to corroborate what has been said in regard to the permanency of the operation. At the time the American Dental Convention met in Boston—some four years since—a young man was brought into the meeting who had had a tooth transplanted. This operation was performed under very unfavorable circumstances. The operator

stated that he had taken the tooth to supply the place of this lateral, from some old teeth he happened to have, and which, being decayed, he filled with gold. Upon trying to insert the tooth in the socket he found it too large, and he accordingly dressed it down and forced it into the socket. At the time we saw it, it had been in wear three years, was perfectly firm in its socket, and exhibited no indication of inflammation at all.

I have myself, in two or three instances, experimented in that line, but not to my entire satisfaction.

I have under treatment a case where the left central incisor was out of place, the apex of the root overlapping the lateral, and the lateral forced out of its position, so that there was comparatively little space between the canine and that tooth. By the use of ligatures, I changed the direction of this root from this angle to a horizontal, moving it back fully a quarter of an inch. I was over nine months in completing this operation, but the result was entirely satisfactory, and this tooth is now perfectly regular in its position.

DR. TAFT: This subject of resetting or replanting teeth is to me a very interesting one. If it amounts to the retention in the mouth of a tooth which could not by any other means be retained, it is a very important and valuable operation.

This operation, moreover, teaches us a great lesson as to the power of nature in the direction of reparation and recuperation. There are circumstances, it seems to me, where the operation may be employed to advantage. At any rate, on two or three occasions, I have resorted to it with what I regard very decided advantage. For instance, I have sometimes found a chronic inflammation—a thickening of the tissue around the teeth—a condition making the tooth of little value, so far as mastication is concerned. I have in some instances taken out these teeth, removed the thickened tissue from the root and replaced the tooth again. In such cases I have almost always succeeded in restoring the tooth to perfect usefulness. I have more frequently employed this operation in the treatment of alveolar abscess, and I regard it as a prompt and efficient method of treatment of that disease, especially those obstinate cases which present a marked degree of resistance to treatment.

This operation is more practicable, of course, with teeth of a single root, than with those having more; but it can be done with teeth of two or even three roots, where the divergence or curvature of the roots is of such a character as to admit of their being taken out and restored to the socket without doing violence to the parts. It has been suggested by some that a divergent root might be taken off, so that the tooth could be placed back with its two buccal surfaces in position and be serviceable. I have never

attempted that operation. Whether it is practicable or not, I do not know. I should think, however, that it was certainly worth the trial.

With teeth of a single root, this is certainly, so far as my experience goes, a valuable mode of treatment in certain classes of alveolar abscesses. The tooth should be removed and all the debris and imperfect tissue taken away, even to the removal of the entire periosteum of the root, if necessary. Then the tooth should be carefully restored to its socket, and in the majority of such cases, the result has been admirable.

There will be cases where difficulties will occur, as where large cavities are formed by an accumulation of pus around the root, and it may be that in such cases the operation is not practicable. I have not had sufficient experience to venture an opinion; but we know in alveolar abscess, where the gums around the socket are wasted away, they are reproduced again. The diseased tissue is removed and nature has an opportunity for reparation—for bringing plasma to the diseased part and organizing it into tissue. I remember a case, a number of years ago, of a gentleman who had six or seven teeth with very large cavities extending down to the ends of the roots. The tooth structure had exfoliated until, with his own hands, he had removed a large portion of the tooth, and there was a large cavity about the ends of the root, formed by the accumulation of pus, and yet, in that instance, entire reparation was made, and a bony wall was rebuilt on the outside of these teeth, making them firm and strong in their position. Now, if nature will effect reparation in a case of that kind, is it not reasonable to suppose that nature will exert her recuperative and restorative power successfully where a tooth is merely drawn out and reinserted? It is a secondary formation, of course, but secondary formations, as we all know, often remain servicable through life, and serve all the purposes of original tissue.

This operation I also consider available in neuralgia and in hypertrophy of cementum. I had a case a while ago where a severe neuralgia seemed to proceed, at intervals, from a superior bicuspid as its initial point. The tooth was not decayed, and there seemed to be no inflammatory action about it. There was, however, a slight uneasiness under percussion, and this fact, together with the fact that the pain seemed to start from that point, led me to conclude that the dfficulty was with that tooth. I therefore removed it, when I found considerable hypertrophy of cementum, considerable redness, and inflammation of the periosteum, and considerable hypertrophy of cementum.

I scraped this all off, down to what I supposed was the original surface of the cementum, taking off all the periosteum from the neck to the point of the tooth. I then replaced the root in its position again. There was a little soreness for two or three days. That, however, diminished quite

rapidly, and I have just received a letter from the patient, saying that she had not had a twinge of neuralgia since that tooth had been taken out. I had another case very similar to this, attended by about the same result.

In reference to the treatment of alveolar abscess: I had a case where there was an abscess of the inferior second bicuspid on the left side—an abscess with an external fistulous opening, half or three-quarters of an inch above the lower margin of the jaw. The patient was a gentleman of rather feeble constitution. This bicuspid had been filled a number of years ago on its posterior proximal surface. He consulted a physician, and was advised by him to have the tooth removed, as the fistulous opening was making a rather unsightly appearance, on account of the depression which was taking place more and more. I consequently removed the tooth, and then cleansed the root, removed the debris, and scraped the root from the neck to the apex. I also cleansed the canal, and removed all the debris from that. I drilled entirely through the canal, filled the tooth completely, and having done all I thought necessary—cleaned the socket out thoroughly—I replaced the tooth.

This cleansing the socket is a matter of considerable importance. It is a good idea to use some kind of an antiseptic in the socket. In this case, I dipped the root into a solution of phenol sodique. There was some soreness for three or four days after, but in a very few days he was using the tooth in mastication. We were somewhat exercised as to what would be the result of the fistulous opening. It, however, in a few days ceased to discharge.

In regard to the depression in the cheek: I directed him to put his finger into his mouth and press that part of the cheek out, and to manipulate it. I saw the case a few days since, and at that time you could not have detected that there was a depression there at all.

Some thirty odd years ago I removed a second bicuspid tooth by mistake, when I should have removed the first molar. I removed the molar, and it occurred to me to replace the bicuspid tooth, which I did. The tooth, in this instance, had no support back of it.

This matter of proper support, let me remark, is an important item. The tooth should be held firmly in position, so that the plasma, which is thrown out to repair the injury, may organize itself perfectly around it, and not be subjected to irritation and disturbance.

This tooth, as I remarked, had no support back of it, but the occlusion was such that it was not disturbed, and it very soon became firm and serviceable. Dr. Watts saw that case last fall, and the tooth was then doing good service. Upon examination of it, he found some imperfection upon the crown of the tooth, and he asked the gentleman to allow him to cut into the dentine and see what the condition of the tooth was. He drilled

down and found quite sensitive dentine, whereupon he concluded that the pulp was living, and desisted from further examination.

A gentleman told me last winter that about a year before he had a tooth under treatment, which was decayed until the pulp was exposed. He removed that tooth, placed a temporary filling in it, and replaced it in the socket. A number of months after that, he removed the temporary filling, and found the pulp living, just as when he first saw it.

This operation, of course, is one to be performed with caution, and the cases where it may apparently be advisable should be scrutinized with great care. We should ascertain beforehand all the pathological tendencies and susceptibilities of the case. Attention to the nutritive functions of the system should be exercised. It is an important thing that the system should be perfectly nourished during the progress of such an operation. I think if proper judgment is exercised, this operation may become an important element in dental practice.

DR. STURGISS (Illinois): In regard to this question of cohesive and non-cohesive gold. I think that both are important factors in securing the highest success in a dental practice. In restoring the contours of teeth, I can make better operations with cohesive gold. In cases where I have very sensitive dentine, I have found it advantageous to commence the operation with soft foil and finish off with cohesive. I use a deeply serrated instrument, so as to interweave my cohesive foil with the soft foil thoroughly, and I am satisfied that I can in that way make a successful operation. By allowing my foil to project somewhat over the edges of the cavity I am able to condense it along the line of junction—swedge it over the edges, so as to make a very tight filling. If I can accomplish this to my satisfaction, I am not so much concerned about the center of the cavity.

In regard to this matter of replanting and transplanting teeth. I must confess that I do not wholly agree with the views which have been advanced. So far as my observation goes I am convinced that transplantation is quite frequently a provocative of abscess. I think that replantation may be made for purposes of articulation, and for the purpose of preservation of the teeth, and restoration of facial symmetry; but in such an operation you have cut off the vital force, and the tooth is dead. A dead tree will stand for years, and so, also, will a dead tooth, but it draws no elements of vitality from the system. It is a dead tooth, and I have not much faith in any thing which is dead, when employed to serve the purposes of a vital agent. I think it is far preferable to save a tooth without destroying its vital connections, when possible.

DR. FIELD: Last April I called upon Dr. Morrison and found him engaged in this business of replanting teeth. He was engaged in filling a

tooth, which he held in his hand, wrapped up in a piece of bibulous paper. He explained that he was performing the operation for a lady, who was then in waiting in the next room. While he was at work the lady came in and said she would return in about half an hour for her tooth; and away she went, leaving her tooth in the Dr.'s hands, the same as you would leave a pair of boots at the shoemaker's.

This tooth was perfectly cold, and apparently dead. If such an operation as this is practicable, then it is certain that we have effected a great revolution in dentistry. I would like to ask Dr. M. if the operation was successful in this instance?

DR. MORRISON: I will state that it was thoroughly successful, and the tooth is now worn to the lady's perfect satisfaction.

DR. ATKINSON: There is so much here that has grown out of the two papers, and the remarks made upon them, that it will be utterly impossible to give even a glance at the different views which have been advanced.

There is a point at which all function has a beginning, and it has a career, terminating either in an abnormal arrestation of its functions, or through having accomplished the intent of its being.

The subject under consideration is, what constitutes the cohesiveness or non-cohesiveness of substances that we use for filling teeth? It is precisely the same that constitutes the coalesence, differentiation, or standing apart of any other two bodies. Any skinless body being brought into contact with another skinless body, coalesces with it. Take two lumps of jelly, or protoplasm. Bring them into contact and they become one lump. Now, what is the reason that what is called soft foil does not cohere upon mere contact? It is that there is that upon it which answers the purpose of a skin, or a pellicle upon the surface. Remove that and you have your cohesive quality restored.

Now, it is this very principle to which we must look for success in replantation and transplantation of teeth. It is through the presence of the blood corpuscles, or lumps of jelly, that constitute the plasma out of which new tissues may be constructed—fused together by means of this principle of coalescence.

I could give you many instances of cures of abscesses where the teeth had been extracted, and where the pulps reunited; but it does not do to say that a pulp united and performed its function as well as ever.

It has been said here, further, that men are capable of determining constitutional conditions, to a degree necessary to justify them in saying that such a tooth is capable of being transplanted or replanted. It is not so. The most eminent authorities do not claim any such power. In order to

recognize constitutional conditions which may bear upon the success of the operation, it is necessary that they be present in an active form, and not in a latent form.

Prof. Abbott's paper was valuable for its review—a review extending back as far as Hunter. If there is any thing that is marvellous, it is that Hunter should have known as much as he did know about the matter; for they had not then learned how to dissect so as to be acquainted with the tissues—their number and nature. Hunter must have been considerably in advance of his time, for he has given us some very valuable suggestions, and in the conclusions at which he arrived, he was generally sound.

In regard to the union of the cock's-comb with the outer and inner circulation of the tooth put upon it, that is still to be seen in the London museum, and settles the question for all time, that a tooth may be reunited, even to the tissue of a bird. That justifies me in the principle I have often advanced: that when points are brought in contact without obstruction, and are plastic in their nature, they unite irrespective of the order in which they are found. Birds, for instance, have no diaphragm; they do not belong to the order of mammalia. They propagate their young by eggs, and the eggs are hatched externally of the body of the one producing the egg. They are so entirely different from mammalia that we would naturally say there was no union possible, but that one single instance I have mentioned, fully establishes it as a thing possible.

The second paper was not so general in its assumptions, nor so sweeping in its assertions; but it was one which I admire very much for the clearness of its statements, and the application of its arguments, which were very forcible and logical.

Prof. Shepard spoke of the union of two surfaces of gold, by contact of the molecules. Are they molecules? By no means. A molecule is a compound body; that is to say, it is a body resultant upon the satisfaction of affinities resident in two or more kinds of atoms, under the influence of a current of energy, which is generally electrical. Loosely speaking, and by a sort of accommodation, the term molecule is used to signify something indivisible, but it is a compound body. A regular aggregation of these molecules constitutes granules; and another regular aggregation of these granules constitutes cells, and here we have the elements of the tissues. When we are dealing with a simple body, such as gold, we have no molecules. We have simply individual particles, and when these are naked, nothing deposited to act as a skin, they unite.

Dr. Thomas: About the first of last April, a girl of some seventeen or eighteen years of age, apparently in the enjoyment of general good health, presented herself for treatment, the trouble being an abscess about the

root of the second inferior bicuspid. I extracted the tooth, when the idea of replanting it occurred to me. I accordingly put the tooth in a glass of water, mixed with a little alcohol, and went on with my work. At the end of the forty minutes, after I had dismissed my patient, I took this tooth into my laboratory and washed it clean, cut off the end of the root a little, and polished it down. I took particular pains to clean off every thing there was upon the cementum. Then I opened up into the cavity, and thoroughly cleaned it from the dead pulp, going to the end of the root, and filling it with Hill's stopping. I then filled the cavity with amalgam, and cleaned the socket as thoroughly as it was possible to do. I then replaced the tooth in the socket. I had little expectation of success, and less because the contiguous molar tooth was gone, leaving this tooth unsupported. I was, however, agreeably disappointed. There was considerable soreness, but in three or four days that passed off, and the tooth became firm in its socket, answering every purpose of mastication as well as ever.

DR. CORYDON PALMER: When you have simply filled a tooth you have only done what any jeweler could have done, and done better. There is more difference between cohesive and non-cohesive foil than simply a pellicle on the surface. Soft foil does not harden under the instrument. The repeated heating of the foil reduces the cohesive quality. It may be damaged by too much handling. Any thing can be done with cohesive foil that can be done with soft, and a great deal more. [Dr. Palmer made some extended remarks, but they were inaudible at the reporter's table, and are consequently necessarily omitted.—REPORTER.]

DR. WINDER: At the age of sixteen, through the carelessness of a dentist, I had a perfectly sound bicuspid extracted in place of a decayed sixth year molar. It was extracted about eleven o'clock in the morning of one day, and was replanted about four o'clock in the afternoon of the next day.

For twenty years I knew no difference between that tooth and any other, except that it was slightly discolored. During the twenty-first year it began to get a little sensitive. In the twenty-second year after this operation it would occasionally, in the morning, be elongated, and I would have to bite it back into its position. I wore it until the twenty-fourth year, when it had to be extracted.

In regard to cohesive gold foil, it is a very important point not to damage the surface by handling. It is important that it be handled in such a manner as to be kept clean throughout the whole operation. As it is well known that it is heat which imparts to it the principle of cohesion, it is important to us that we have the right degree of heat.

If you take your gold just as it comes from the gold-beater's, having allowed it to remain untouched and unhandled, you have the best possible

condition that the gold can be in. It may not be known to you that repeated heatings depreciate. It should be taken just as it comes from the gold-beater and rolled up, not too tightly. In that way it can be kept any length of time without losing its beautiful metallic surface. Kept in this condition, and properly worked, the most perfect fillings can be made. It is just as soft and well adapted to its place as soft foil. If it is not worked too much, you can uniformly get as good results as with non-cohesive foil.

DR. MCQUILLEN: It is perhaps well that we should have a clearer definition of the difference between cohesion and adhesion, than has yet been given.

According to the best authority, cohesion acts between particles or bodies of the same kind, and at immeasurably small distances. To this is referred the phenomena of solidification and crystalization. Adhesion acts between unlike substances at immeasurably small distances, and forms mixed masses.

I would state that in 1856 or 1857, when it was first proposed to render gold more cohesive by passing it over a lamp, I instituted a series of experiments, and as a result came to the conclusion that the soft foil was better adapted for the purpose of filling teeth than gold so annealed.

I took a plate of steel in which a hole had been bored, this plate slipping into another by a kind of dove-tail arrangement, and packed this hole thoroughly with soft gold. Then I slipped the plate out and had a perfect cylinder of gold.

I subjected the annealed gold to the same process, and I found I could not get as much annealed gold into the same cavity with the same force, as I could soft foil. There was a difference of about one grain in ten. Applying the result of these experiments to our operations, it seemed to me that we would have the same result. I have since, however, learned to recognize a value in this annealed foil. In a majority of operations, indeed I may say in all operations, I would use this soft foil, and then in finishing off the filling, the annealed foil may be used advantageously.

DR. CROUSE: I think there has been too much of an indorsement given to cohesive foil by this body—a body which is so authoritative, and which exercises so much influence over the methods of practice adopted by the average practitioner.

I commenced with soft foil, and have used it mostly in my practice. I have, however, fully tested the merits of cohesive foil and have made successful fillings with it, but I am able to do much better work in less time, by the use of soft foil. Unless you are very thorough with your cohesive foil you will have failures.

There is another part of the discussion which I do not wholly approve of: that is the laying so much stress upon the replantation and transplanting of teeth. I think it is very rarely necessary. A man ought not to be driven to this recourse more than two or three times in a practice of a lifetime.

As to alveolar abscesses, I do not think I have seen a hundred in ten years, and when I have had them I have found no difficulty in treating them successfully, by much less violent methods and remedies.

PROF. SHEPARD: I find that I have been somewhat misunderstood in the remarks which I made this morning.

I drew a diagram as an illustration of what always takes place in a greater or less degree, wherever cohesive gold is used. If the gold is in the form of a rope, then it is in the form in which there are most arches shown. If it is in the form of a mat or ribbon, where a dozen or twenty thicknesses are used, one on top of the other before it is annealed, there are points of contact enough, uniting layer to layer in the mass, to make a series of elongated arches, which are really arches, although the angle is not so great as I represented it on the board. If there are open spaces at all, and if there are points of contacts to make arches, just in proportion to the size of the mass will you have difficulty in effecting a thorough condensation on account of the case-hardening at the surface, consolidating a few of the arches at the top and at the bottom.

If you take a mass of non-cohesive gold and make a cylinder, having twenty or thirty of the folds going round and round, and then apply force to the cylinder or to the side of it, there is no case-hardening, no resisting air-chambers and arches, but the force is exerted equally throughout the whole mass. The advantages of using non-cohesive gold in this way are, that it can be used with great rapidity and with very uniform results, adapting itself beautifully to the inequalities of the dentine. Cohesive gold may be profitably used where the nature of the case demands the strength of welded gold, as in contour fillings, turning corners, etc.; but I think in almost all other cases non-cohesive gold is best adapted to the purpose.

Dr. Palmer asserts that it takes a long time for non-cohesive gold to get heated red hot, and that after it is heated red hot, if you hammer it, you will find that it will heat again more readily. This he attributes to a consolidation of the molecules. He mistakes the cause. The cause is due to the film of oil upon the surface, preventing it in the first instance; from becoming heated so quickly. Upon this same principle workers in iron will, after first having immersed their arm in water, plunge it with impunity into molten lead. It is protected from the immediate effects of the heat by the film of water.

DR. BUTLER: It is certain that non-cohesive gold has been used a much longer time and perhaps, if careful statistics were preserved, they would prove non-cohesive gold to have been more successful than cohesive. But that may be due to the latter's having been improperly manipulated. I believe it to be absolutely necessary, in order to secure the best results, to adopt the elective mode of practice. There has been considerable discussion on the subject of how to make gold cohesive or non-cohesive. You may take gold that has been brought to the cohesive condition and anneal it a few times, and you will find it less cohesive than it was; therefore it is better not to tamper with it after it leaves the hands of the beater. But we seem, in this discussion, to ignore all other materials for filling the teeth. There are cases where neither cohesive or non-cohesive gold will answer the purpose.

Tin is an excellent material. At certain ages and with certain teeth, nothing is better than tin as a preservative. With gold, it is frequently the case that our best fillings fail, as though we had put in an entirely foreign substance—one entirely incompatible.

DR. CLOWES: The great object of dentistry is the salvation of teeth. Now to say that teeth can be uniformly filled successfully with one material, is to make a statement as absurd as to say that all diseases may be treated successfully with one medicine. Let cohesive gold be used in its appropriate place; let non-cohesive gold be used in its appropriate place, and so with tin and amalgam. For many years I used non-cohesive gold exclusively, and it was a long time after cohesive gold came out before I could be induced to give it a trial; but I at last did so, and its beautiful properties very soon overcame all the prejudices I had entertained against it.

There is one point which I fear is not sufficiently appreciated, and that is that there is no salvation for teeth unless they are properly separated, and they should not only be separated, but care should be taken to round off the corners.

There is another point of which I wish to speak, and that is in regard to filling roots with osteo-plastic. The root should be thoroughly cleansed, filled with osteo-plastic, and the tooth filled with either amalgam or gold. In performing this operation the operator should be very careful not to drill through the end or the side of the root. The root should be cleansed as thoroughly as possible, and if there is some matter remaining in the end of the root, introduce a little chloride of zinc as a disinfectant.

DR. KEELY: I desire to relate a case I had of replantation. A gentleman had a second superior molar decayed, on the posterior surface. The teeth were very much crowded, and the cavity seemed to be almost inaccessible. I told the gentleman that the only way of preserving the tooth

appeared to be by removing, filling, and returning it to the socket. He consented to that method of treatment, and I therefore extracted the tooth. I found on the anterior proximal surface of the third molar a large cavity, which I filled, and then turned my attention to the tooth I had extracted. I filled the root with Hill's stopping, and then filled the cavity. I presume the tooth was out about an hour and a half or two hours. Upon attempting to return it, I found that the buccal root projected so far that I could not get it back. I took the cutting forceps and cut off about one-third of that root, so that I could return the tooth. There was some soreness for a day or two, but very soon the tooth was restored to a firm and healthy condition.

DR. BOGUE said he had performed the operation three times; once it was a failure. There was an abscess from half an inch of cotton protruding through the apex. He then spoke of the restoration of a front tooth with platinum-foil in such a manner as not to be observable, and which completely remedied a hissing which had been caused by the separation between the teeth, and which annoyed the patient (a clergyman) very much.

DR. JOHN ALLEN spoke of a case where four front teeth were knocked out of the mouth of a boy thirteen years of age; the teeth fell in the sand, but were replaced and did well, and did not lose color. He thought there had been union of the lining membrane. He had had cases so sensitive that it was impossible to excavate, and had extracted and returned with success, though he had had failures. He also mentioned a case of a lady who had a front tooth which appeared to be of much better quality than the rest, and on inquiry she stated that that tooth was extracted from her little negro boy's mouth and replanted in her own; it had done well.

REPORT OF THE COMMITTEE

ON

DENTAL CHEMISTRY.

By S. B. PALMER, Chairman.

Your Committee on Dental Chemistry, after due consideration, thought it advisable to so divide their labors that each member of the committee could furnish a report in accordance with his own course of study and investigation.

Having undertaken the task of presenting what appears to be newly applied principles, in connection with chemical and electrical action in the oral cavity, I present the following extracts from the mass of dental literature, accumulated within the last twelve months. Great care has been taken to present for discussion such claims, theories or principles only, as we believe relate to applied dental chemistry. This will account for the omission of many valuable discoveries in general chemistry, as well as much that relates to this subject, that could not be incorporated in a single report. It must be apparent to all that there is an increased interest manifest in the too long neglected department of dental chemistry. In quoting from the papers before us, we wish to be guided by justice in giving credit where it is due; still, for the advancement of science in this direction, we deem it our first duty to present principles, not men, and, so far as we are able, facts rather than theories, as topics for discussion.

The first paper from which I will make extracts is by Henry S. Chase, M. D., St. Louis, read before the Illinois, Iowa and St. Louis Dental societies. As this paper is quite lengthy, and has been published in several of the journals, I will only give the fundamental principles there defined, connected by quotation from other sources, in a manner to give definite ideas of the claims for truth in the study of nature, and its relations to conservative and operative dentistry.

Dr. Chase commences his paper on oral electricity by comparing the oral cavity to a single cell in a voltaic battery, wherein the mixed saliva, decomposing food, together with acids of fruits, drinks, etc., answers to the fluid of the cell. According to electrical laws, the greater the departure of the oral fluids from a neutral or slightly alkaline saliva, the greater the chemical effect upon the tooth substance or dentos, as called by the author. Voltaic electricity having the power to disintegrate even metal, as well as animal and vegetable substances, has also the power to decompose dentos. Ordinarily, the healthy mouth is not in a condition to disintegrate dentos. This departure is brought about in various ways. Thermo-electrical currents are set up by sudden changes of temperature. There are more or less hiding places in the fissures of the teeth and between them, in which the mixed saliva has sufficient power to set up electrical action. There is probably more or less electricity evolved in the ordinary mouth nearly all the time, more especially if there is a tooth plugged with *any metal whatever.*

The writer says: "Electrical currents probably do no harm, excepting when, by their quantity, intensity and constant direction, they produce chemical disintegration of dentos, or produce pathological changes in the pulp or contents of the dentine tubes." "When plugs leak so as to allow the mixed saliva to permeate between the walls of the cavity and the plug itself, we have in each such tooth a battery, and there are as many batteries of a single cup each, in the mouth, as there are such leaky plugs."

To illustrate this a figure is introduced, which is well known to those acquainted with voltaic electricity, viz.: when a plate of impure zinc is used in a battery, between the zinc itself and the particles of other metals which the zinc may contain, innumerable batteries are formed, the sulphuric acid acting upon these metals with different degrees of energy.

Voltaic batteries for mechanical purposes are usually constructed of two metals or elements, one of which is not acted upon by the acid, the other easily acted upon. Currents, however, are evolved from two metals, both of which are acted upon by chemical agents, or between them and other substances. The electrical current passes from the positive to the negative element, and that element is called positive which is most easily acted upon by the fluids in which the elements are immersed, and that element is negative which is less acted upon than the positive, with which it is in the

circuit. Change of the fluid of the cup will often change the relative position of the elements. Lead is positive to copper in nitric acid; but in a solution of sulphide of sodium, copper is positive to lead. Dr. Chase then says the elements of batteries, which are sometimes found in the mouth, are enamel, dentine, muscle, gold, dental amalgam, tin, guttapercha, and oxy-chlo. zinc. Each metalic plug forms a battery by its union with the tooth in which it is placed. If the plugs are water-tight, then the electrical action is limited to the margins of the plug; but if the plug is leaky, then there is electrical action set up within the cavity at every point at which the filling and the dentos touch.

These statements sound much like those contained in the report last year, which originated in the committee. I feel greater freedom in presenting them at this time, since the late experiments originated outside of the committee, and are the result of long and patient investigation, as your committee can well appreciate. "A thing is never too often repeated which is never sufficiently learned." If we should spend a day upon this subject and then arrive at principles, so that we could be directed thereby in our practice, this would prove a satisfactory session.

In returning to the paper—passing over pages full of truthful figures and suggestions—we find this pertinent statement: "Every material for plugging teeth is negative to dentos; consequently dentos is placed in a critical position by every plug which it receives, because it is *positive* to every dental plug." That material which stands nearest to dentos on the potential scale, would give the greatest assurance of safety, so far as disintegration of the tooth substance could be caused by electrical currents, and by its association with a negative substance to form a battery. Quoting from an article in the July number of the Dental Cosmos, 1876, by the same author, the title of which is: "What shall we fill teeth with?" he says: "We now know that gold, being so much further removed from dentos on the electro-positive scale than any other filling material that we now use, it is the most dangerous one we can plug a tooth with, if preservation of the latter is the sole motive for the operation; but when beauty is considered, it must often be used at the risk of less permanency.

"The best of alloys are safer than gold in any cavity, but would generally be thought advisable only in the posterior teeth from considerations of appearance." Pure tin foil," he says, "is safer than gold in any cavity in which it can be properly placed; but as it is very soft, and will not withstand mastication more than three or four years on grinding surfaces, its usefulness is thereby circumscribed. Its use must be limited, in a great measure, to back teeth, as its color is no better than that of modern improved alloys, which keep their original color."

Mention is then made of using gold and tin combined, which gives the

optical effect of gold, and yet has all the effective preservative influence of tin, by lining the cavity with tin and filling with gold.

In a paper read before the Dental Society, of the State of New York, at Albany, July 13th, headed: "Choice of materials for filling teeth," the electrical action resulting from this combination, is defined in the following manner: "So long as a filling of gold and tin remains moisture-tight, there is no action, no current beneath the plug, which is the case with a plug of any material. 'The whole need not a physician, but they that are sick.' When the plug fails to exclude fluids, or the moisture reaches the plug through the poorly organized dentos, the tin becomes oxydized to a greater degree, by reason of its connection with a negative element, the gold. As the oxyd of tin is the antiseptic sought to arrest decay, this is furnished in greater abundance by combination. As the tin becomes encrusted by the oxyd thus formed, like any battery with its plates oxydized, the current ceases, and thus the tin is saved from further loss. The same principle underlies all alloys.

In connection with this subject, the same paper mentions the action produced by two or more fillings in the same tooth, or in close proximity in opposite teeth. I mention this particular point in practice, because facts and former theories disagree. Theories based upon the non-conductivity of dentos, do not allow contact between fillings when it is possible to separate them. Science teaches that each separate filling in connection with dentos is a battery; thus two fillings separated by a thin partition of dentos are two batteries, both acting upon and through the separating walls, to their speedy disintegration. When firmly connected, the two fillings assume the character of two metallic elements—a single battery. Metals being by far better conductors than tooth structure, the current and action is confined to the plug, while the dentos, which in case of a single plug is one of the elements, in this instance is no longer so, but the cup in which the elements are placed. To better illustrate this action, imagine the hands grasping the poles of a powerful battery; while in contact the current cannot be perceived; on separating, so that muscle forms a part of the circuit, a shock is the result. This principle gives license for piecing out gold plugs with amalgam if necessary, without injury to the tooth or irritation to the dentine. Approximate fillings of gold and tin or amalgam, must be regarded as two distinct batteries, when by the introduction of food or any conducting medium they become connected, the current passing through the dentine and pulps, if the latter are present, to the great annoyance of the patient. Since this class of fillings cannot be firmly united, chemistry teaches that they should be thoroughly separated.

In reviewing a paper by Thomas Fletcher, M. C. S., Warrington, England, read before the New York Odontological Society, December 21, 1875,

with regard to discoloration of amalgam fillings upon the surface in contact with dentos, Mr. Fletcher, after giving the results of numerous experiments with various alloys, says: "These experiments have resulted in what I believe to be the discovery of an absolute law which rules all plastic fillings, and which not only gives a process for testing all new compounds with certainty, but also gives the conditions under which any special alloy requires to be worked to give the best possible results which can be obtained with it. The foundation of this law or principle is "Given—any crevice or joint between two surfaces, one or both of which can be made to yield to pressure, the presence of moisture at the edge of the crevice or in the body of one of the surfaces entails the parting of the two, and the penetration of moisture by the force of capillary action, if an excess of moisture is present, the amount of this penetration being ruled by the ability to yield, of the side or sides of the crevice. This power is always ready to act, and is sufficient, in the course of weeks or months, to entirely change the form of any filling which will yield to constant pressure."

In the estimation of your committee, the principle claimed by Mr. Fletcher is worthy of consideration. He claims to have proved its correctness by practical and theoretical tests, and I believe the observation of others will confirm this statement.

Further on in this paper Mr. Fletcher gives the results of experience and experiments with oxy-chloride as a material for permanent fillings, in a manner quite convincing that he is well acquainted with its action and durability.

In private correspondence he acknowledges what all, who use it, come to learn, that we are either in want of a more reliable article, or a law by which to use that we have, to secure positive results. The electrical tests by your committee predict that chemical law is against the universal success of a compound of the nature and composition of oxy-chloride. While it may withstand the action of diluted hydro-chloric acid, it is itself decomposed by alkaline secretion. Much has been said in favor of this material during the past year, even for permanent fillings; yet, in every paper, so far as my observation extends, there has been quite a margin left for irregularities in its results. Permanency of oxy-chloride is yet to be obtained. It is built up by certain laws of chemical composition, and for most uses to which such an article would be applied, would be faultless. When in the oral cavity it is brought in fluid contact with a wide range of elements, some of which appear to have affinity for its constituent elements, decomposition is the result. Thus we seem to be without a positive principle to warrant success in the use of this material.

The following extract is from the New York Medical Record, by Dr. J. E. P. Hodson, M. D. Though there may be nothing new to the observing

dentist in this quotation, it shows that the medical profession, too, is investigating these subjects for the benefit of humanity. He says:

"In any illness, involving a feverish condition, the fluids of the mouth are constantly and intensely acid, as respects the teeth, as in any medicine administered by the physician; and moreover, from the high temperature of the buccal cavity, at such times, the power of these acids for evil is greatly augmented. Further, a direct consequence of these conditions is the especially rapid fermentation and decomposition of all food lodged between and around the teeth, and the consequent elimination of other deleterious acids, all forming a mighty power, under which it is not surprising that the tooth structure should melt away like dew before the sun. It is, indeed, a very surprising thing that any tooth should live to tell the tale."

Time allows the presentation of only one more of the many promises of chemistry for the advancement of dental science.

The discovery and application of an agent intended to be introduced under gold, or other fillings, for the purpose of allaying irritation caused by the plug, to reduce thermal shocks, arising from sudden changes of temperature, etc., has come to my notice through Prof. E. W. Foster, M. D., of Boston. I am not aware that this claim of Dr. Foster has been made public through the journals, and furthermore, I do not know to what extent your committee ought to introduce it at this time. I trust Dr. Foster will overlook this premature mention, if such it is, since I understand that he is only waiting to collect facts and data sufficient to warrant its use and adoption. After many experiments and careful observation, he concludes that hypo-phosphite of lime introduced into a cavity previous to filling—the process I will not here describe—will, in addition to the above-mentioned benefits, enter into the dentine tubes, and in a measure do for a poorly calcified tooth what nature failed to do, restore it in a degree, to a normal condition; in other words, it is an external application of a material of the character of dentine, which saves the latter from outside disturbances, while it stimulates nature to complete the work of calcification within, as it could not do subject to irritation. Tests already made by your committee, to ascertain its relation when compared with dentine and the various materials used for fillings, show wonderful harmony.

Your committee mention this subject in hopes that some of our Boston members may enlighten you as to the utility of this new application.

In the collection of matter for this report, your committee has endeavored to act as your assimilative agent, collecting from the mass such claims for facts and principles as we thought would be discussed, digested and appropriated towards the strengthening and building up of this body. I think it must be apparent that we, as a scientific association, have yet to learn principles, of which we are still ignorant, respecting the chemical relations and action of matter with which we have to do.

SLEEP VS. ANÆSTHESIA.

By J. S. CASSIDY, of the committee on Dental Chemistry.

Fully appreciating the difficulty of proving by experiment the nature of the chemical changes that take place between any substance when introduced into a living body, and the tissues which it affects, the writer nevertheless believes that a large number of these changes may be suspected, if not proven by analogy; and this in the light of a partial knowledge of the physical and electrical behavior of certain individual elements, under stated conditions, may serve to render our theories advanced in this connection, not wholly devoid of seeming probability.

It is evidently not unreasonable to assume that a substance capable of subduing all the special senses of a physically perfect animal, must either act of itself as a direct poison, or conversely, as a factor with power to induce such chemical reactions as will result in the formation of new compounds, which latter, in their molecular incipiency, produce the requisite insensibility to pain, and are, therefore, the real anæsthetic.

There appears to exist a vague impression in the minds of many scientific men that there is a very close relationship between anæsthesia and natural sleep; that the difference is merely in degree, not in kind. There is, however, a wide distinction between these phenomena, if examined in regard to their chemical relations.

Anæsthesia is certainly opposed to the natural order, by involving increased chemical action, frequently to a stage beyond functional control, thus reversing the normal conditions through which vitality is maintained; while, on the contrary, sleep is a negation of molecular death. Its unconsciousness is the concomitant of chemical nihilism. Although, within reasonable limits, a voluntary suspension of certain functions, it is not

rational to suppose that sleep is exclusively a negative condition, a mere cessation from wonted activity, a "rest for the weary," but rather, in accordance with all the known laws of nature, which teach that in order to repair an acknowledged loss, there must be a proportional restitution of the matter or force abstracted, we premise that sleep *per se* has to deal with a positive entity, that it is a process to accumulate a tangible something, removed from the body by mental, physical or functional exercise.

There is, indeed, a strong probability that the chemical changes coincident with animal life, are in the main, processes of oxidation. But if oxygen be the potential element through whose union with other kinds of matter each thought, word and motion is produced, whence comes it in quantity sufficient to support such processes? We answer that it comes only during periods of physiological inanition, when mind and body are at rest, and that while in repose the system receives and appropriates its quantum of oxygen, commensurate in amount with recent expenditure of force, and to serve as a reservation for supporting the retrograde metamorphosis of tissues during the immediately following hours of labor.

Careful observations have demonstrated the fact that there is relatively more oxygen inhaled and less carbonic acid exhaled by a healthy animal while enjoying the apathy of sleep, than occurs in a like space of time devoted to physical or mental exercise; while on the other hand a vast increase in the production and expulsion of carbonic acid is occasioned by violent physical exertion, out of all proportion in quantity to the oxygen simultaneously inhaled.

These facts indicate the proposition that the oxygen inhaled during the regularly recurring hours of labor is devoted mainly to the duty of assisting the carbonic acid to penetrate into the pulmonary air cells by means of a quasi gaseous diffusion, and that the comparatively small volume of oxygen which disappears at this time is appropriated by the ferrous carbonate present in the circulation, in order to change the iron compound into the required ferric oxide.

In short, we submit that sleep is an oxygenating process, and that while in the opposite state, i. e., awake, the aeration of the blood does not consist so much in the reception of oxygen, as in the expulsion of carbonic acid.

Now, what bearing have the foregoing considerations upon the therapy of anæsthesia as manifested by nitrous oxide, ether, etc.

Nitrous oxide, as its name implies, is a compound of the gases nitrogen and oxygen (N^2 O). Chemically, it is similar to atmospheric air, except that it is far more energetic than the latter, a property due to the large proportion of oxygen it contains, and to the fact that in any known reaction, in which it directly takes a part, this element, its only active principle, assumes the nascent state. It does not unite directly as a compound with

other bodies, but it readily suffers decomposition at varying temperatures, under the influence of oxidizable substances; and in this light only can it be viewed as a supporter of either combustion or respiration. It possesses an oxidizing power greater even than free oxygen, and in many cases equal to ozone. If a metal be attacked by it, a metallic oxide will be formed. If a hydrocarbon be burned with it, the formation of the normal oxides respectively of hydrogen (H^2 O) and carbon (C O_2), will ensue. Indeed, oxides are the only class of compounds it appears capable of forming.

Now, as there is but *one* science of chemistry, we are compelled to admit that the same laws which govern the decomposition and recomposition of definite compounds, apply as well to those changes which occur under the influence of vitality--minus soul or spirit—as to the ordinary reactions that take place in the inanimate world; and inasmuch as nitrous oxide is a supporter of combustion only by virtue of the oxygen it contains, we are free to believe that it also supports animal respiration only by means of the same qualitive property. A course of experiments, covering a period of several years, has convinced the writer that nitrous oxide *is* a supporter of respiration, provided the carbonic acid—which accumulates under its administration much more rapidly than during ordinary breathing—be freely and continuously expelled. If this precaution be observed, the experiment may continue almost indefinitely, with regard to time, the individual, meanwhile, being natural in feature and perfectly unconscious to pain; but if the exhalations be not regulated—as in the ordinary administration of the gas—with this object in view, an alteration from the natural to an appearance bordering on the horrible, immediately follows, affording all the visible evidences of partial poisoning with carbonic acid. Such a condition necessarily interrupts further proceedings, being analagous, in many respects, to the cessation of ordinary combustion in a closed vessel, until the excess of the non-supporting gas (C O^2) is removed.

Moreover, as nitrous oxide has not the ability to support combustion in its capacity of a compound (i. e., without itself undergoing decomposition), it is more than probable that it also refuses, in its nature of a compound, to support respiration; but rather that it acts thus, in addition to the familiar anæsthetic effects it produces, through a divorce of its constituent elements.

We can not, of course, follow the reactions in detail, albeit we must remember that, unlike the inhalation of atmospheric air, both nitrogen and oxygen unified into an individual substance, are introduced into the circulation, and thence reaching the vivified ultimate molecules, whose death is correlative with physical life, their bond of union is overcome, and agreeable to the circumstances of the polarity of the elements involved, the formation of new bodies results. The oxygen set free is enabled, while in its nascent state, to supersede the prerogatives of the passive oxygen of

reserve obtained in sleep, thus occasioning a rapid increase in otherwise natural reactions; notable among which, is a greatly augmented development of carbonic acid. This latter substance appears to be the only appreciable product of the internal reaction of nitrous oxide, and there is no antagonism to any scientific fact in our advancing the assumption that, to the excessive development of this gas, is due the special anæsthesia. Certain it is, that in moments of great physical or mental effort, when, as before stated, the quantity of carbonic acid is proportionately increased, the sensorium is invariably less susceptible to the perception of local injury.

Perhaps, indeed, the mere luxury of living, the molecular interchange consequent on the exercise of any function pertaining to sentient animals, would be unendurable, were it not that these changes are accompanied by a co-existent and co-extensive evolution of carbonic acid, possessed with properties to restrain the effect of force on matter, and to tone the sensibilities to the requisite degree of harmony with nature's wants.

We do not claim that carbonic acid is an anæsthetic, in the ordinary meaning of the term. Its power to extinguish life, when received by inhalation, is too effective to admit of its use for such a purpose. Notwithstanding, there can be no difference in its nature, whether produced by synthesis or analysis; its influence on a living body is modified according to the circumstances and source of its production. Being a ubiquitous and continuous product of a wonderful living laboratory, it could not, when developed in excess by any internal exciting cause, effect therein, an approximation to the injury sustained through *inhaling* an almost inappreciable quantity.

The employment of anæsthetics, if at all admissible, should obviously be restricted to those agents which act only by virtue of decomposition when inhaled, thus inducing simply the requisite increase of natural chemical reaction, in contradistinction to those bodies which, unchanging, act directly, and are therefore immediately incompatible with normal functions. Of this latter class, chloroform seems to be a true representative. Even when exhibited in small volume, its ability, so often manifested, "like a dagger propelled by hate," to smite the heart unto death, is suggestive of this view, to say nothing of its well-known chemical nature.

In the first class we include with nitrous oxide, ethylic oxide, or common ether. Its molecular construction, and better still, the comparative absence of attendant evils by its use, favor such an hypothesis. But, as the consideration of its method of action would involve much more space than should be allotted to us here, and as dogmatism might appear as an excuse for brevity, we are constrained to restrict this paper to its present imits.

VOLUNTEER ESSAY ON SOLUTION.

By J. TAFT.

In the work of growth and disintegration in the organic and the mineral kingdoms, an important part is due to the alternate change of matter into a fluid condition and its subsequent return to a solid form. In most cases such changes are possible by the agency of heat; but high temperatures are not generally necessary for giving fluidity to the constituents of the great works of nature and of art, and in the vast operations of the visible world, as well as in the domain of life, the end is accomplished by means of solution and precipitation. The exceedingly small amount of lime dissolved in the ocean and constantly introduced by the waters of many rivers, furnishes materials for the growth of the shells of innumerable mollusca. The phosphate of lime introduced into the blood in small quantities by nutrition, affords material for the growth of bone in the animal economy. The sap of trees also seems to act as a solvent for the various substances which are absorbed from the soil, or produced by the agency of vital forces.

Solution is a liquefaction of a solid by means of a fluid, and is wholly different from the mechanical suspension of a powder in a liquid, which allows it to fall after agitation ceases. The mud of rivers is suspended temporarily in this way, but the salt of the ocean is permanently held by its waters and can not be separated by the mere agency of gravity. Some doubts prevail as to the exact nature of the forces which occasion solution; some writers regarding it as due to the physical effects of adhesion, but others, reasoning from a more careful consideration of facts, look on it as a weak modification of the force of affinity. As in the case of chemical union, solution proceeds between different substances in a manner which experiment alone can reveal. Water is a good solvent for a large number of salts, but it fails to dissolve resins, fats, oils, and other substances which

are readily soluble in alcohol. Yet alcohol is incapable of dissolving gum, common salt, and other substances, which readily yield to the solvent power of water.

The influence of heat is generally very favorable to solution. At the freezing point, water dissolves only about 3 per cent. of its weight of alum, but it will dissolve 90 per cent. at the temperature of 160 degrees F., and much more than its own weight at 212 degrees. The solubility of chlorate of potassa, nitrate of potassa, and nitrate of soda, is also much increased by increase of temperature; yet an opposite effect is to be observed in the case of sulphate of lime, which heat renders less soluble in water. Common salt, or chloride of sodium, is nearly equally soluble in hot and in cold water; but sulphate of soda has a more singular peculiarity, as its solubility increases until the temperature reaches 92 F., but decreases when the heat rises above that point.

Of other circumstances affecting solubility, pressure plays an important part, but it acts chiefly by raising the boiling point of the solvent. In the manufacture of paper from straw, the silica from this material is dissolved by water heated in strong boilers, without allowing the steam to escape. Apart from this *modus operandi*, pressure has a slight direct effect in diminishing solubility, and the subject has received much attention in consequence of its connection with certain natural phenomena. Though the rapid evaporation on the Mediterranean Sea produces a constant current from the Atlantic Ocean, at the Straits of Gibralter, it does not seem to have given the preponderance of salt due to the age which geologists assign to the enclosed watery domain. It was accordingly supposed by Lyell that salt must be deposited in the deep localities of the Mediterranean, where the strongly compressed waters failed to exert their normal solvent power. Experiments, however, though showing that pressure slightly diminishes solubility, affords no confirmation of the opinion that salt would deposit, even in the greatest depths of the ocean, which are far deeper than those of inland seas.

The solution of salts and other substances in water is sometimes attended with an elevation and sometimes with a depression of temperature. On dissolving sal-ammoniac, nitrate of ammonia, or chloride of potassium, the production of cold is very decided, but it takes place in a less degree when common salt enters into solution in water. Chloride of calcium and sulphate of magnesia when rendered anhydrous by heat, develop considerable heat when introduced into water; and the calorific action is still greater on mixing water with the strong bases or acids. These results afford good illustrations of the conflicting effects of the course of affinity and the change to fluidity, the one producing heat and the other cold. It is well known that in the liquefaction of ice there are 140 degrees of heat absorbed

or rendered latent, and the waters of crystalization being in a solid condition, cause a similar absorption, or loss of heat, when they are liquefied by dissolving. On the other hand, the slight exertion of affinity for the solvent causes a development of heat. Anhydrous sulphate of soda dissolving in water causes an elevation of temperature, but the ordinary crystals of the salt, which contain seven equivalents of water, occasions cold on solution; and the cold will be greater on dissolving sulphate of soda which had crystalized below the freezing point, and contained twelve equivalents of water in a solid form.

Yet, not only water, but almost all bodies absorb heat in passing from a solid into a fluid form; and for this reason even many salts containing no waters of crystalization produce cold in dissolving, as the heating power is very feeble. When strong bases come in contact with water, the calorific action attending a powerful play of affinity over-rules the cooling influence. In the cases considered, I have supposed the menstruum to be pure water, but the effect is modified by the presence of foreign substances in any considerable proportion. Muriatic acid, for instance, when combined with water, increases very much the cooling effects which the fluid produces in dissolving crystalized sulphate of soda.

As a general rule, salts dissolving in water preserve their characters in such a manner that they can be recovered in their original condition on the evaporation of the menstruum. Some exceptions to this rule are to be found, however, in the salts of bismuth, antimony, and some of the more rare metals. Chloride of antimony, for instance, dissolves without any visible alteration in a small quantity of water, but on making the solution weaker, by adding more water, the greater part of the salt is decomposed, and is coverted into oxide of antimony and muriatic acid. The nitrate of bismuth is also decomposed in a similar way, and a basic salt precipitated, which has little solubility. The result in these and similar instances is due to the part which solution plays in modifying the cause of affinity, the tendency being, invariably, to form compounds which are insoluble.

In the economy of animal and vegetable life, solution and precipitation play an important part, though they are further removed from the domain of exact inquiry, in consequence of the mystery which involves all vital phenomena. In the case where insoluble ossific matter is deposited from a previous solution in the blood, there is evidently a chemical change, and by separating from an excess of acid, the soluble phosphate of lime is converted into an insoluble phosphate. The separation must be ascribed to the influence of vital forces, which in this case, seems to act in opposition to chemical affinity. It is indeed true that soluble phosphate of lime, when present in the urine, is deposited, after a time, as putrefaction takes place, and the resulting ammonia neutralizes the superfluous acid. But in the

normal condition of the human system, ammonia is never formed in the blood, nor could the fixed alkalies exist in the vital fluids in a condition to produce the change.

Some analogy to the growth of bone is present in the growth of shell and of coral rocks. Shells differ from the bones of vertebrated animals, in being composed almost entirely of carbonate of lime, and in not being permeated by blood vessels. As carbonate of lime is slightly soluble in water containing free carbonic acid, and as precipitation would be caused by removing or neutralizing this acid, it would seem that shells might grow by a power similar to that concerned in ossification. The observations of Carpenter, however, have shown that the calcareous matter of shells, when viewed under the microscope, exhibits a crystaline structure, and is to be considered as a secretion, so that it may be regarded as matter abandoned by vital to chemical force. In the growth of coral, there seems to be a similar excretion of carbonate of lime. About 20 years ago, Professor Horsford, of Harvard University, advanced the idea that the growth of coral was due to the decomposition of sulphate of lime by carbonate of ammonia, the former being derived from sea water, the latter being produced by the decay of animal matter. But these views, which were brought before the American Association for the Advancement of Science, received much opposition, and found little support from any other scientist besides the author.

As to the organic matter in animal and vegetable tissue, there is much difficulty in tracing its passage from a fluid to a solid form. Liebig has attempted to explain the operation in trees, while maintaining (with Priestly) that their carbon is derived from the decomposition of the carbonic acid of the air. "The wood of a tree," says the eminent German chemist, "can not be formed as wood in the leaves, but a compound must be formed, capable of being converted into wood. This compound must be in solution, and accompanied by another containing nitrogen." The explanation seems, however, to involve many difficulties, though there is much ground for the part assigned to nitrogenized compounds in the growth of cells, to which so important a part has been ascribed by modern physiologists.

DISCUSSIONS.

PROF. SMITH (Philadelphia): I will preface the remarks which I may have to make upon the subject of chemistry, with a few words on operative dentistry. What is operative dentistry? It is that science which has for its object the preservation of the human teeth. Now, since we commenced that subject, we have been discussing gold and gold only, except the subject of the transplantation of teeth.

I congratulate you most heartily upon having had read before you one paper of incalculable value. That is the paper upon the subject of dental chemistry. That has a most important bearing on the subject of operative dentistry.

The subject of dental chemistry was fully brought out here one year ago by Dr. Palmer, and yet it remains now just where it was then, and there does not appear to be any better understanding of it now than there was at that time. Now, those principles, thoroughly understood, will place the conservation of the natural teeth a quarter of a century in advance of its present condition. But that paper was but little appreciated.

Chemistry comes in and says that in certain cases gold is one of the worst materials that can be used. It is a positively dangerous material in certain cases. Dr. Wetherbee informs us, with all gravity, that he never has any failures at the cervical walls in his bicuspids in using gold. Now we have a gentleman in this city, who has in his office a row of little bottles, and in those bottles he has some gold plugs. These bottles are all labelled, and I think, if Dr. Wetherbee could see these specimens, he would be willing to modify his statement in regard to failures at the cervical walls. Our experience here is just the reverse of that statement, and yet I venture to say that we have many men here in Philadelphia who can fill teeth just as well as he can. And these failures which occur, in spite of the best material used, and in spite of the best skill, are due to chemical changes. The question is, how to prevent this galvanic action, which exists between the tooth structure and the filling material, for that such an action does exist, there can be no doubt. And just in proportion as we advance in the scale

of difference of galvanic action existing between the dentine and the filling material, just so far does the filling material become dangerous.

We all know that there are no better preservatives of the human teeth than gutta-percha and oxy-chloride of zinc, and for the simple reason that there is not that difference between the dentine and the filling material that exists when we have placed gold in connection with dentine. So, also, amalgam, in certain teeth, is a better preservative than gold. When we arrive at perfect harmony between the dentine and the material used for filling, then we shall have destroyed this action, and not until then. Now, how can we accomplish this? One method of accomplishing it, is by the use of oxy-chloride of zinc and gold. These can be combined in such a way as to prevent this chemical and galvanic action. The gold should be isolated from the tooth structure, and in certain kinds of tooth structure we are never sure of preventing this action, unless we do this. Placing gold in connection with shaky and soft tooth structure, is one of the worst things we can do. We can place amalgam in connection with such tooth structure with far greater hope of good results.

DR. WETHERBEE: What is there about amalgam that preserves the teeth better than gold?

PROF. SMITH: I don't profess to know much about the subject of chemistry, but I do know this: in order to produce a galvanic current, we have zinc at one pole and platinum at the other. If you place between them another metal, like silver, for instance, then we have a weaker current. Now, in the other case, gold is one pole and dentine another. Now, if we place between the two some metal which will weaken that current, we have a better preservative than gold. That is the reason why oxy-chloride of zinc or amalgam is better, because they diminish the current, and we have not the same amount of galvanic action.

DR. WETHERBEE: The gentleman misquotes me. I did not intend to say that I had no failures. What I intended to say was, that I had no more failures with cohesive gold than with soft gold. I said that except with a certain class of teeth, I had no trouble at the cervical walls.

Now, that amalgam is a better preservative of the teeth than gold, in certain cases, is due, as I apprehend, simply and solely to the fact of the formation of sulphide of silver, which, in teeth that are soft and loaded with acid secretions, is a better preservative than gold.

Acrid and other morbid secretions play an important part in the degeneracy of the teeth, especially where gold is used as a preservative, and I think they are much oftener a cause of decay than galvanic or electrical action. By keeping on hand paper for testing the acidity or alkalinity of

the secretions of the mouth, the dentist can at any time determine the character of the secretion, and be able, in a great measure, if not wholly, by proper treatment, to remedy those conditions.

DR. BARKER: It has been stated here that after a tooth has been removed and then reinserted in the socket, that there is a possibility, if not a probability, of a reunion of the pulp which had been severed.

I deny that, and I am willing to be called immodest in making such a denial. Such an assertion is in contravention of all authority, and all physiological and pathological facts and principles with which I am acquainted.

The idea that a tissue of the character of pulp tissue—having the power of retrocession and contraction—is capable of reuniting after having been severed, is perfectly absurd.

DR. MILLS: It seems to me that we have overlooked a very important consideration in the treatment of the teeth, whether by one material or another. We have dwelt largely upon the properties of gold, and galvanic and chemical action, and we give them a prominence over this one simple question, which they by no means relatively deserve. I refer to cleanliness —attention to purity and freedom from any foreign deposits upon and about the teeth.

This is the secret of success, and it is utterly useless to seek for ulterior causes while we ignore this. We all know that deposits on the teeth excite chemical action, not only deposits of food, but other foreign accretions. The pathological condition of the mouth, and the conditions immediately affecting the teeth, should be most carefully studied. Inattention to cleanliness conduces to such diseases as wasting away of the alveolar process, and a breaking down of the tooth structure. I consider it the duty of every dentist to instruct his patients in this direction.

DR. CUNNINGHAM (England): For the courtesy which has been extended to me of being present and participating in the proceedings of this eminent and learned body, I am quite grateful.

I come before you to make a few remarks upon this occasion, not by virtue of my being a foreigner, but because I am an experimenter, to some extent, in the field of electro-chemistry. Dr. Palmer I understand to be the first gentleman, on this side of the water, to call attention to this important subject. I can not and do not pretend to speak with regard to the practical bearing of this subject. That must be left to older gentleman than myself. Many of you gentlemen may not be aware that this subject of electro-chemistry has already attracted a prominent member of the dental profession. The gentlemen to whom I refer is Prof. Bridgeman, now, I fear, dead,

but whose works may be found in the third volume of the transactions of the Odontological Society, of London. In that volume you will find a brief essay, published some twelve years ago, which attributes dental caries to electrical and voltaic action. I will not attempt either to explain or refute his theory.

I have demonstrated that tin is in a negative condition in relation to dentine, when it is put in the mouth, but gold is also negative, and in a much higher degree. Dr. Palmer has proved in his experiments, that tin, in an electro-chemical point of view, is superior to gold as a filling material, but it has the practical disadvantage of softness of texture, and also a quality which, in the hands of unscupulous dentists, is against it, viz: cheapness.

[The speaker then described some experiments in which he had been engaged, with the object of ascertaining the galvanic action between dentine and filling materials, the results being in general in keeping with Dr. Palmer's experiments. The remarks were highly technical, and being largely illustrated upon the black-board, an intelligible report is impossible. —REPORTER.]

DR. FLAGG: As to Dr. Palmer's paper, I will say that I never approached any subject, in connection with dentistry, which has impressed me with such a sense of importance as this of dental chemistry.

My sole object, during the progress of my professional career, has been the salvation of the natural teeth to my patients. In the pursuit of that object, I have broken down my health, and when restored, I have pursued the same object with unabated zeal; but my success has not been all that I could desire. There have been very few teeth presented to me which I have not made an effort to save, however far gone they may have appeared to be. Because I have attempted so much, and taken so broad a ground, my failures have been proportionately increased, and I have been met by the assertion that it was because I could not fill teeth.

Now, for the good of humanity, and for the purpose of saving teeth, I have endeavored to find out why my fillings in these poor, miserable teeth, good for nothing at all, except to the possessor, so constantly failed.

We find in the June Cosmos the following passages. The first is from a gentleman of unquestioned ability. He writes as follows: "I question if there are any in the profession who have not been convinced, notwithstanding the fact that gold, in some of its forms, is unquestionably the best substance known to science for filling cavities of decay in the human teeth, that gold has many serious objections to its general use—objections too well known to need more than passing notice. It can not but be clear to every thinking mind among us, that there must exist in nature's laboratory some-

where, a substance, or number of substances, which * * * * possess all the requisite qualities of gold, and yet would be free from many of the objectionable features of that metal. If this conclusion be correct, no one, I apprehend, will for a moment hesitate to acknowledge that it is the duty of every intelligent member of our specialty to do all that lies in his power to bring to light and usefulness some substance that can be well packed in a tithe of the time needed for a good gold filling." Here is the testimony of a gentleman whose ability is unquestioned, and no one will aver that he is not able to use gold to the best advantage.

For my part, I am not surprised at the way in which this subject is presented by Dr. Palmer, who is investigating in the line suggested by the writer I have just quoted. I am not surprised that it should be received rather indifferently. It is too deep and original a subject to acquire an immediate hold upon the interest of the profession ; but the time will come when there will be many energetic investigators in this direction.

[The speaker then read several quotations from the Dental Cosmos, from articles written by Dr. M. H. Webb, Prof. H. S. Chase, W. H. Dwinelle, and others, going to show that in many cases it is impossible to preserve teeth with gold, on account of electro-chemical action between the gold and dentine. The speaker then continued :]

Now, in my opinion, no gentleman has a right to put forth such views as have been referred to here—one man saying he knows so and so, and another saying that he knows just the contrary. It is as absurd for a man to say that thousands of teeth have been filled with amalgam that ought to have been filled with gold, as it would be for me to say that thousands of teeth have been filled with gold that ought to have been filled with amalgam. With no personal motive whatever, but with a desire to settle conflicting opinions by unmistakable evidence of facts, I commenced the collection of what I call my "Rogue's gallery"—putting into bottles the beautiful, first-class gold fillings of celebrated fillers, which have lamentably failed, many of them in less than one year. These little bottles I have labelled, each with the name of the operator, the date of the introduction of the filling, the time it remained serviceable, and the nature of the tooth structure and cavity. I have done this with a view of ascertaining where gold will fail in spite of the best skill.

One of the nicest of those fillings my friend McDonneld took from a cavity with a hair-probe—picked it out utterly loose and good for nothing. Now, gentlemen, when I have seen teeth which could not be preserved by the best operator with gold,—seen gutta-percha substituted, and the filling stand well, I am by no means inclined to brand that article as an ephemeral filling.

DR. WEBB: It has been asserted that gold is "*a purely mechanical remedy*" for the prevention of a recurrence of decay, while the oxide formed from another metal, as in any amalgam, "turns the teeth to a dark color and checks caries." This "preservation" has been said to be "*chemical.*"

If carious dentine be properly and thoroughly removed, and every particle of disintegrated enamel be taken away from the margin of the cavity, and gold be properly prepared, introduced and impacted against every part of tooth structure involved, and without there having been the slightest movement of such gold, if the filling be then properly finished down to and polished with the surrounding enamel, there will then be no space for moisture. There can, therefore, be no chemical action and electric currents evolved thereby between gold and calcium. The only manner in which this can occur, is by disintegration at some point, or points around or about the margin of enamel against which the gold is impacted. If the operation has been properly performed, and the margins of enamel be free from contact with the adjoining tooth, and have been so manipulated as that it shall be cleansed by the action of saliva, such disintegration will not recur.

It is very difficult to thus perfectly perform operations in some instances and under some conditions.

Manipulative ability, merely, can not apply this "purely mechanical remedy." To accomplish all which I have just indicated—that almost any of the duties of the faithful and conscientious practitioner may be performed—it is necessary that one understand the anatomical, physiological and pathological conditions and relations; in a word, really first-class operations can not be performed without some such knowledge, as well as keen perception and the exercise of correct and efficient judgment.

The same care is required for the preservation of the teeth, by the arrestation of caries and prevention of its recurrence through filling of the cavity of decay with another material, as with gold, notwithstanding the assertion that an amalgamated mass chemically preserves the remaining structure. Oxidation can not take place where moisture can not reach; hence, where moisture is, there may not only be such oxidation, but also chemical action, evolution of electric currents, and disintegration and destruction of tissue, except in those instances where there is black decay—where "the salts formed by decomposition of the mineral portions of the teeth are insoluble, and become polarized in a negative position to the decomposing agent."

It seems fair to conclude that, in consideration of all this, none of the materials which have so far been used for the preservation of the teeth are equal to gold, even if, as has been asserted, it is "a purely mechanical remedy," in contradistinction to amalgam with its chemically preservative influence.

I, therefore, now, as ever, hold that if a fully qualified practitioner and capable operator desires to perform operations, and to preserve the teeth as perfectly as possible, he should, unless it be in very rare instances, make use of gold as a permanent filling, for the preservation of the valuable organs he is called upon to treat, and if he does not possess the ability (and such ability will always manifest itself—no amount of talking will cover over incapacity or incapability,) to perform operations as they should be, then, rather than attempt to save these organs by unskillfully and imperfectly inserting gold in cavities of decay, one should make use of some material which, because of its plasticity, may enable him to more perfectly perform the operation—it being decidedly better to insert amalgam than to extract a tooth which the operator may thus restore, or partially restore, to usefulness.

Failure in dental operations is attributable, in the majority of instances at least, to the very imperfect manner in which such operations are performed, and all this should be duly and honestly considered and acknowledged before attributing the cause of failure to the action of acids and electric currents evolved from chemical action.

Dr. S. B. Palmer: In a paper which was recently read before the New York State Dental Society, there is this assertion: that probably in the hands of a first-class operator, 95 per cent. of teeth may be preserved with gold. I think that that is giving a fair chance to those who claim that they can save nearly all teeth with gold; but with an ordinary operator there may not be more than 50 per cent. thus saved.

I agree with Dr. Webb that these failures, in a great measure, are due to imperfect operations, either from inaccessibility of the cavity, or imperfect contact of the gold against the dentine; but if a gold filling fails in the hands of a practitioner of average respectability in certain cavities and certain teeth, it reduces that tooth to the second class of teeth, viz: those which must be saved by some other agency than gold.

I will answer the question, so pointedly put by Dr. Smith, in regard to the action of amalgam, and I will include any of the metallic fillings subject to oxydation—wherein it differs in preservative action from gold. I will use a figure which it seems ought to be plain to all of you. We will imagine a cup containing a solution of sulphide of copper, in which there is a copper plate and a zinc plate immersed. The action is rapid—there is a current evolved for a time, and very soon the precipitate of copper upon the zinc polarizes, and they are restored in harmony with each other, and the action ceases. It becomes corroded, or polarized, or reduced to the same electrical condition as that of the negative. The negative and the positive have reached the same electrical condition. Now, in the introduction of a tin or amalgam filling, which is properly inserted, and which

does not shrink, the tooth is preserved as perfectly as it can be by a gold filling. As has been remarked here by Dr. Webb, where there is no moisture, there is no action, but you can not rely on the mechanical perfection of a filling.

There is a need for something better than we have. Sulphide of silver—the oxydation from this plug entering into the dental tubuli—exerts a preservative influence and neutralizes the destructive action. For the same principle the zinc plate was rendered equal to the copper plate and neutralized the action between the two, and thus you have a preserving property.

REPORT ON THERAPEUTICS.

By C. A. BRACKETT, of the committee.

Therapeutics is not a brilliant subject. The work of medication, as compared with surgical and mechanical practice, is slow and indefinite—it may be intangible and unsatisfactory. Hence it is that by the average practitioner, and by the average patient, *impatient* for results, it has not been so much thought of as fine operations and well arranged dentures. Until within quite recent years, the subject has held only a very subordinate position in dental education; and the training of many men now in practice has not included that thorough study of principles upon which all intelligent therapeutical practice must be based. It is not too much to say that much of the dental medication of the past has been empirical; and the practice of the present is not entirely free from the same charge.

It is apparent, however, that each succeeding year makes steps of progress toward more careful, discriminating medication. Practitioners generally are putting more thought into their treatment of the lesions that come within their province, and intelligent patients are appreciating it. So far as has come within the cognizance of the New England member of your committee, the progress of the past year in dental therapeutics has been, not so much in the introduction of new remedies, or in revolutionized methods of practice, as in a more consistent, considerate and reasonable application and administration of healing agencies. A better knowledge of anatomy, histology, physiology, chemistry, and the principles of surgery, of pathology, etiology, and symtomatology, has led inevitably to a better practice of therapeutics. Practitioners now, instead of making one remedy, or one system of treatment, from a limited list of medicines, do duty for all the lesions coming under the same general class, are with greater breadth of view, considering the almost infinite variety of conditions, individual

peculiarities, stages of progress of disease, and other circumstances affecting the indications, and are choosing from the entire range of the materia medica such agencies as in the present state of our knowledge appear best suited to the special case and condition in hand. In dental theurapeutics, as has been forcibly expressed concerning excellence in another field, the use of brains is the most important thing, and that element is being more and more exercised by the progressive practitioner of to-day.

It is not the plan, and hardly the place, of this member of your committee, to go very much into detail. Allusion is briefly made to only a few points. Perhaps in no branch of therapeutics has there been more activity and interest during the past year than in prophylactics. The large percentage of the present generation with teeth of soft texture and crowded, irregular arrangement, has led to much deep thought concerning the causes of those defects, and the possible means to be adopted for the prevention of the further operation of those causes in the cases of the individuals themselves, and also the next and succeeding generations. The concurring testimony of most careful observers is, that probably one cause of the condition of things just stated, may be found in the deficient supply during development of those elements upon which the bones and teeth depend for their hardness and integrity. Acting upon this idea, some practitioners have endeavored to supply the deficiency by a eourse of diet rich in lime salts, or by the administration of some chemical preparation of the same materials in assimilative form. Perhaps this plan has not yet been sufficiently tested for us to know that it will always be followed by definite beneficial results. The theory appears very reasonable, and very gratifying effects have been obtained in some instances. Prof. L. D. Shepard, of Boston, reported such a case at a meeting of the New York Odontological Society, in December, 1875*.

It seems, however, to be a principle in this method of treatment, that the earlier in the life of an individual it is adopted, the more effectual it will be. Your committee does not understand that there is very much hope of improving the texture of the dental tissues of a patient in adult life. It is thought that quite as much can be done in the way of favoring a strong dental development, through the system of the mother, while the child is yet *in utero* and during lactation, as at any subsequent interval.

Another condition of things that dentists are more and more feeling the necessity of combatting, is acidity of the fluids with which the teeth are bathed. Carefully conducted tests, instituted during the past year, in a series of mouths, have shown that a strictly normal condition of the oral fluids is met with only exceptionally, while acid mouths appear as the rule. With the corrosive effects of this acidity when present in any marked de-

*Frans. N. Y., Odont. Soc., 1875, p. 9.

gree, we are only too familiar, and we recognize it as a statement of truth, that no dentist who employs only mechanical means in combatting these ravages, is doing his full duty by his patients.

In medication for this trouble, antacids are used, both locally and systemically, and all influences tending to give tone to the system and improve the general health, should be brought to bear. Perhaps, as special practitioners, we need to have emphasized the principle, that very little progress can be made in the local treatment of lesions dependent upon systemic conditions.

Dentists are instructing their patients concerning the valuable hygienic influences upon the teeth and their investments, of legitimate exercise. The mastication of hard and tough food assuredly contributes to health of the gums, and increased density and resistive power in the teeth. Such exercise is well supplemented by the judicious use of the brush.

One other point in proplyactics has reference to a means that has been suggested for the prevention of sensitiveness and its sometimes serious *sequelæ* following the introduction of a metallic filling. In an article, entitled "Gold in Teeth," by Dr. E. W. Foster, then of Milwaukee, published in the Cosmos, of March, 1873, Vol. XV, p. 136, allusion was made to the hyperphosphite of lime as being most happily adapted to secure the object mentioned at the head of this paragraph. At a meeting of the American Academy of Dental Science, held in Boston in May last, Dr. Foster presented a more elaborate paper on hyperphosphite of lime, testifying that three years additional experience had only confirmed the favorable views concerning it, expressed in the former paper. The theory and details of its use are better gathered from Dr. Foster's own writings, than from any attempted *resume* of them here. This member of your committee, however, desires to state that in a limited three months use of the material, it appears to possess many of the advantages claimed for it by the gentleman who has brought it to the notice of the profession.

As a whole, the tendency of therapeutical thought and practice in New England evinces a disposition to take advantage of all attainable sources of knowledge and means of improvement, and to make that knowledge subserve the comfort, health and best interests of patients and humanity at large.

REPORT

ON

DENTAL THERAPEUTICS.

By W. H. ATKINSON, of the committee.

A report on therapeutics, to be satisfactory, must be approximately complete.

Any thing like a complete history of the conception of the necessity of therapia, and the slow aggregation of the facts pertaining thereto, demands a review of the rise and progress of all that is included in recorded medical knowledge, and in the face of these statements, the magnitude of the task, and the impossibility of its ready accomplishment, will be apparent to all.

Had the appointing power given indications how to treat the subject, and to what extent to pursue it, I would be less embarrassed in the undertaking.

Therapeutics can not be said to be an exact science, although each limb of every proposition pertaining thereto has its root and its explanation based upon the same common foundation with mathematics, music and astronomy.

Long before anatomy was known, physiology revealed, or pathology concieved, in anything like a connected series of perceptions of body function and perversion of function, there were those who were inspired to assume the conduct of diseases of the human body and mind; and every addition to therapeutics, from that day to this, has been an assumption of a revelation, or a real revealment; therefore, all the laws of human anatomy and of human physiology, must be understood to enable one to assert

that the organs are in place and the functions normal; all of which is but the foundation of the standard of perfection of body and function, any perversion of which will constitute the beginning of disease, or pathological manifestation.

Any thing that will remove the perversion in body or function, is an example of therapeutic agency. The persistency of type of form and function are necessary elements in the diagnosis of aberrations in either.

It may be well questioned whether there is any exact standard of the measures of specific body and function yet revealed sufficiently plain to be definitely formulated; therefore, therapeutical science as formulated, only approximates to scientific certitude.

Each individual, being the offspring of diverse convergent lines of ancestral endowment, that may be favored or hindered by the surrounding circumstances and culture of growth and education, it becomes necessary to comprehend all these ancestral impulses and their possibilities, to enable us to lay out the probable career of the individual in question.

At one time, each human being is potentially and actually a part of two diversely endowed secretory apparatuses, denominated father and mother. The confluence of these two products of secretion constitutes the inception of a new career, as resultant equation of the plus quantity of mass and energy of the parent stocks. This point of confluence of the two *semens* is the point of inception of individual career. The product of this confluence is denominated a germ, and all the changes that follow during the entire life or career of the body in after life is but the *evolution* and practicalization of the potentialities *involved* at the time of the mutual impregnation of the two semens, or the production of this germ.

I said that the production of this germ was an equation of diverse hemispheres of mass and energy. A further explanation of what I mean by equation is necessary, to enable us to account for the predominance of paternal and maternal characteristics in the offspring.

The paternal hemisphere may stand in the relation of a dyad, (that is, a body with two acting measures of affinity) to a maternal hemisphere of two monads, (bodies with one acting measure of affinity,) and thus effect the equation of measure of bonds, with diverse number of elements composing the new body; or this power of endowment may be reversed, and the father provide the two monads and the mother the one dyad. This reversal of order of bonds of endowment may be supposed to be accepted under stress of circumstances, in preference to a failure to accomplish impregnation.

Albeit, the normal confluence would be effected in fullest measure of equation in its true sense, by the combination of molecules equally endowed in number of acting bonds of affinity.

Probably this last is the only example of a true, physiologically endowed offspring.

Many boys take after their mothers during infancy, youth and adolesence, after which they gradually simulate their fathers in maturity and advanced years.

In the first instance their constitutions demand a treatment similar to that adapted to their mothers; in the second instance, a treatment adapted to their father's, will be demanded.

Disease is imperfectly performed functional activity, therefore the simplest example of disease is a minor expression of function.

The energy that brings the functional tension to the normal standard, is the first example of the presence of therapeutic agency.

It thus appears that therapia depends upon the law of demand and supply of measure of affinity requisite to the formation of the factors of function of the human body, in general in the organs, and specially in the elements of the organs.

Immediate influx of energy is immediate cure of debility. *Mediate* influx is mediate restoration, *intermediate* influx the example of intermediate curative activity.

These are all examples of supply of needed energy requisite to the performance of function.

The example of immediate satisfaction of demand occurs spontaneously, in fields where similarity of tension of dynamic and static bonds of affinity are present.

Mediate energy is the resultant of union of tensions out of harmony to the needy territory, becoming compatible through confluence of the incompatible separate bonds, which confluence is the mediator that renders these bonds compatible and appropriable to the territory demanding the supply of energy.

Intermediate energy is that form of functioning power, that is produced by incrematory processes, few or many, to attenuate its bonds of affinity and attune it in dynamic tension to the point to be supplied.

Generation of tissues depends upon reciprocal interpenetration, or satisfaction of bonds, or measures of power to unite, occurring in the elements or units of tissues.

Maintenance of tissues consists in the feeding of these units.

Reproduction of tissues follows the formulæ of the process of production of tissues, by the conversion of pabulum into cells, and cells into tissues.

That example of reproduction of tissues which I have denominated

maintenance of tissues, may be said to consist in a regular advent and transit of cells along the line of the fibre of the tissues, the cell or corpuscle converting pabulum into the substance of its own body, by a process of cell-feeding analagous to breathing; that is, by taking in the pabulum endosmotically, and placing it where needed in the body of the cell and its processes, and removing the worn out and dissociated pabulum by an exosmotic expiratory movement.

This process of cell-feeding favors the progression of the cell as an element of the tissue, from the base of the filament along the line of its fibre towards the peripheral extremity, whence it is shed as an epithelial cell in secretions, excretions and desquamations, so soon as it ceases to be capable of further appropriation of pabulum.

In case of considerable loss of tissue by mechanical violence, another form of reproduction of tissues présents itself, strictly analagous to the process of original generation. That is to say, a pocket must be secured in the surrounding parts to hold the protoplasm out of which to construct, by a regenerative process, the tissues of replacement. This pocket stands for uterus; the exuded protoplasm for liquor amnii, into which the new blood-tracts from the adjoining capillaries project themselves to construct the tissues of replacement, according to embryological transitions of alternation of the deciduous or preparatory stages, into simple blood tracts or sinuses convert into capillaries venioles, and arterioles, and thus lay the machinery for bringing the elements to the territory, wherewith to construct the tissues according to the original type.

Exsected nerves and bones are capable of this kind of replacement or regeneration, (where the necessary pockets are secured), so exactly like the original structures as to elude detection.

If we attempt to sift the essential and useful from the non-essential and hurtful, in the fields of therapeutical investigation, we must be willing to take a step at a time, go slowly, observe closely, and decide cautiously, in accordance with the stage of our progress, in the attempt to understand what constitutes health, disease and cure, in whatever particular case may be the object of study.

Health is the exercise of full measure of function. Disease is some interruption or minification of this harmonial expression.

It may then well be asked, "Have we any such example of exercise of function among men?"

To understand the full measure of health, it is important to know in what the measure consists, and my reply to that question is, ", "It depends upon the degree of satisfaction of desire being complete, when expressed among atoms, molecules, cells, tissues, organs and bodies composed of organs, in which the interchanges consist of amplifications and minifica-

tions of combinations and separations upon a scale or series of bonds seven-fold in degree.

To understand the physiological expression of the molecular metamorphosis of the human body, the disturbances of which call for therapia, it becomes necessary for us to understand not only the mass presentation of harmonial and inharmonial function, but also to analyze it by tracing it to its elemental expressions, to do which it becomes necessary to unravel the modes of biological and chemical metamorphoses, as the series of steps of one category instead of as heretofore, ignoring chemistry in biology and biology in chemistry.

Molecular metamorphosis is claimed to be primary biological activity, whilst chemical activity is claimed to be a motion without life, the stupidity of which will be made apparent by any well-conducted chemical investigation.

Let us see: Chemistry does not presume to account for the existence of atoms, but busies itself with the association and dissociation of these elemental bodies. Most of their behavior in combination and separation has been made known to us by the empirical and so-called accidental experiments of the laboratory.

To such extent has this prevailed, that it is regarded as unsafe to form an opinion of how any two or more bodies will behave, when placed in hitherto untried relations, and chemical affinities are said to be known solely by the crucial test of experimentation.

Let us take the example of nitrogen and oxygen and see if their behavior, under the circumstances, does not reveal to us the fact that they have both intelligence and volition, the satisfaction of which in their various measures generates the diverse bodies, that we call nitrous oxide, nitric oxide, nitrous acid, hypo-nitric acid and nitric acid, differing in capability of action upon the human body, all the way from a respirable inoccuous gas to the terribly escharotic and destructive dense liquid, known as nitric acid or "aqua fortis."

Let us now ask, "What constitutes the difference between these various bodies?" and learn that it is the mutual reciprocation of bonds or units of energy, being satisfied or saturated in what is called "saturation of these bonds."

What are the circumstances necessary to the combination of these atoms by which the new bodies, known as molecules, are generated? Nearness, "within the sphere of influence," and a current of energy, known as the electric current, discharged from the positive to the negative pole, are the necessary conditions for the metamorphosis of the atoms into molecules.

This current stands as high-priest to awaken and justify in marriage the

hitherto potential, now active, measures of energy, through the exercise of which energy, the diverse atoms, are metamorphosed into the new body.

This is true in the simplest as well as the most complicated example of metamorphosis in all three kingdoms—mineral, vegetable and animal.

The awakening of energy must be complete, to secure completeness of its exercise in the formation of the new body. It will, therefore, be manifest that when the awakening is but partial, the body produced will be short of a standard measure of energy in functional activity, in the ratio of the minification of the awakened activity.

That we may have some adequate conception of the great variety of potential bonds to be awakened and joined, to secure human protoplasm with full measure of endowment of psychical and physical capability in the effected product, as presented in the complete human adult, male and female, as elaborators of this wonderful dual seminal presence, through which alone the human type is continued, we must remember that the metamorphoses of profit and loss of mass and energy belonging to the mineral and vegetable kingdoms were the necessary steps to produce the amplification and the refinement of molecular metamorphosis, the values of all of which are potentially held in animal protoplasm, the most refined example of which is the human protoplasm as presented in the vivified germ from which the new being arises.

To the end that we may be able to recognize physiological and pathological activities as the foundation of disease and the cure thereof, I am constrained to present a tabulation of physiological developmental processes as wrought out and arranged by Wm. Fishbough, which he names "Pantagram of Developmental Biology," and kindly consents that I should copy and use in this relation.

Mass and energy, or matter and spirit, are the factors of protoplasm, any separate naked portion of which may be regarded as potentially holding and actually operating the seven modes of function, or materialization of spirit in factors of function in :

1st—Dermal, or limitory and protective function.
2nd—Nutritive, or supporting function.
3rd—Respiratory, or breathing function.
4th—Cardiac, or circulatory function.
5th—Moto-sentient, or innervating function.
6th—Histo-organic, body or anatomical form.
7th—Reproductive, or generative function.

This first protoplasmic monad, or amœba, without differential organs, as factors of differential function, may be said to be alternately ommi—dermal, (all skin), ommi-stomatic, (all mouth), ommi-spiracular, (all spir-

acle or breathing hole), ommi-cardiac, (all heart), ommi-neural, (all nerve), ommi-organic, (all organs), ommi-genital, (all generative, any portion being endowed with the capacities of the whole as organic individual), thus presenting us with the actual functions of the human body, without displaying to sight the special machinery of the perfectly differentiated human body, the differentiations of which grow out of the demand for the special function to be operated by special organ, which constitutes the freedom and coincidence of all these in their perfected presentment in the human mind and body, as the crowning excellence of biological manifestation.

All efforts to understand and formulate the processes of production and differentiation of factors of function, result in some sort of classification to mark the modes of dynamic embodiment of energy in mass, or spirit in matter, the differences of form of body being dictated by the use to which they are to be put, whether that use be special or general, which can alone be proved by minute observation of the career of each.

That is to say, that any number of naked portions of protoplasm being brought together, will coalesce into one homogeneous mass without differentiation, but when any portion of protoplasm becomes enclosed within a limitary membrane, it may be converted into neural, connective, glanular, muscular, or osteal primates of tissue, according to the position of its limitation, in agreement to the type of the body to which it belongs, and this type can only be known by its agreements with the adults from which it was obtained.

That is to say, that the human embryo being an undifferentiated amœba, must pass through all the degrees of the invertebrata, or mollusca, vertebrata and mammalia, to the bimana or fully enfranchised genus and species homo, to present us with the culmination of functions of mind and body in the unitary type of completeness of the whole in MAN.

The deterioration of any function, or factor of function, is properly a sickening process. Any application of energy or mode of energy by which the deterioration or sickening is overcome or removed, is properly a curative or therapeutic agent, whether that be dynamic, psychic, chemical or mechanical in character.

Cure, then, consists in restoring to soundness of the function and of the part, in other words, of destroying and removing abnormal functions and abnormal growths, that the physiological energies may hold normal sway in the production and maintenance of the growth to ripeness, and shedding, in serial order, of the elements of the tissues and organs, to maintain their integrity as essential parts of the physiological machinery.

In making application of therapeutical agencies to the human body, we should bear in mind the sources whence we derive our "armamentarium," or means of cure.

These are divisible into immediate, mediate, and intermediate examples of presentment of energy, and are variously derived from the animal, vegetable and mineral kingdoms, and all depend upon measures of energy, or dynamics, for their ability to effect their purpose.

All new bodies and all new processes arise in an occult and intangible presence, that gradually becomes perceptible and tangible to our means of observation; that is to say, all solids pass through the various stages of vaporous, liquid, colloid and solid forms of presentment, by which we know and classify them by predominance of these qualities.

Predominance of crystalline character marks the mineral kingdom; predominance of cellular character marks the vegetable kingdom; whilst predominance of colloidal, or soft-solid bodies, is the characteristic sign of the animal kingdom.

It will thus be seen that the mineral kingdom solidifies by simple accretion; that the vegetable kingdom is formulated upon cellulation and accretion; and the animal body is formed and sustained by corpusculation, cellulation and accretion in alternations of predominance.

Therapeutists advocate a very wide range of therapia, from the sheerest "expetante," watch and wait system, to the most pronounced and heroic depletion by bleeding, emesis, catharsis and diaphoresis, "ad deliqueum animi," each advocating his own view strenuously, to the exclusion of all others, thus befogging the unlearned and begetting disgust or indifference, which prevents the elaboration and demonstration of the true inclusive, general system of therapia, that investigates every fact and relegates it to its proper place.

The poly-pharmacists advocate a great variety of articles combined in one prescription as a single remedy, while the uni-pharmacists, their opponents, deny the possibility of arriving at certainty of cure by this means.

Those who expect to understand all the changes that take place between the medicines administered and the nutritional changes that follow, will have a difficult task to justify their expectations, in proportion to the number of articles that enter into the remedies they use.

There is one point in therapeutics too little regarded by those who write upon the subject. I refer to what is known as personal compatibility and incompatibility of medicines, or idiosyncrasy of patient to physician and to remedy; that is to say, the same prescription given by different physicians will not be followed by like results. There seems to be something in the personality of him who prescribes; that goes with the medicine to cause it to accomplish the goodness of his intention.

This goodness of intention or desire to be of service to the sufferer, is the directive agency through which the potentiality of all remedies expresses itself in the solutions and resolutions that constitute the cure.

Were this not so, as an emanation from an individual personality, all remedies would operate uniformly in the cases to which they were applied.

Not until we shall have had a new deal in the classification of therapeutics, will it be possible for us to be efficient in practice by merely following out the formulæ most accepted among the learned in such matters.

When that new and comprehensive system of therapia makes its appearance, it will dissipate the dense atmosphere of narrow selfishness that envelopes each special system of therapia, and enable therapeutists in general to reject the irrelevant and utilize the relevant in each special case without the prejudices pertaining to a partial culture.

DISCUSSIONS.

DR. BARKER: I must say that I was somewhat disappointed in the statement made in the first paper that was read, that but little progress had been made in the department of dental surgery within the past year. This indicates, it seems to me, a rather narrow view on the part of the author. During the past year we have had several valuable therapeutic agents brought to light, and experiments have been made rendering their advantageous properties somewhat familiar. It seems to me that the paper has ignored a very authoritative essay published some years ago in the Dental Times, upon the sulphites and hypo-sulphites. Since that time I have used these compounds with considerable success, particularly in the treatment of cases where I wanted to remedy certain peculiar conditions always present in cases of retrograde metamorphosis.

I also want to call attention to another agent, which has been used considerably in dental practice during the past year, viz: salycilic acid. This agent has been found to be decidedly advantageous in certain pathological conditions. It is not supposed that it will take the place of creosote or carbolic acid to any great extent; yet, at the same time, it has valuable

uses. An eminent gentleman, well known to all of you, said that in obtaining that agent, it seemed as if we had got the very "spirit" of carbolic acid. But it has disappointed me in some respects, although I have found it very advantageous in certain conditions of the oral cavity.

DR. ATKINSON: I did not intend to occupy further the time of this body. I am not willing, however, that this subject should pass without making some effort to justify the course I have taken. I am aware that it is new; I am aware that it is not merely passing over the old hum-drum methods, but I have laid bare the system of function, the aberration of which requires the application of a remedy.

I had intended to take advantage of the opportunity to state that the seat of nutrient activity must be the seat of repair, and that the seat is in the cells, though not in the cells as cells *per se*. The cells themselves are made up of condensed protoplasm in which the function takes place, and operates all the changes of healty and unhealthy nutrition. Now, what is the action of any food, any poison, or remedy—for any substance capable of acting upon the body may hold the relation of food, poison, or remedy, to that body, in accordance with the state that that body is in, and when I say "that body," I mean the cell and its granulous constituents, taking it as something which is made up of multiplicity. The currents and movements of what has been called by the last speaker, "retrograde metamorphosis," take place within the cells of the human body. I made the statement that nutrition, the appropriation of either food or medicine, was an act of imbibition by the law of endosmose; but when the substance that constitutes the remedy is in the body of the cell proper, a change takes place in it, and it would be folly for me to give to you the crude apprehensions that I have about it.

A MEMBER: Has not every physiologist taken that position?

DR. ATKINSON: I think not. I assert that, so far as I am aware, secretion and excretion have never been pronounced to be moulting acts, except by myself—acts of moulting epthelion. Where the fluid produced by the cell is to be used again in the system, it is called secretion, when otherwise, it is called excretion; but the act is the same. That is to say, it is operated by the same machinery.

I have read almost all the books, and I have observed that they always halt half-way in explaining the laws of nutrient activity. They do not strike "hard-pan." That is the reason I am in earnest. All tissues have to be fed, but you can not feed a tissue with an insoluble substance. The only way that a tissue can be affected by an insoluble substance is by what has been called the action of presence, or catalytic action, and this is unex-

plicable, unless you acknowledge an unseen action called spirit. We all know that certain mental conditions excite to action certain of the secretory organs. That is what I call dynamic or catalytic action.

DR. BARKER: So far as I am able to understand the gentleman who has just resumed his seat, I must beg leave to differ with him, and I wish to put pathologists, so far as I have read them, right upon the record.

It is usually asserted that cell action occurs upon the application or administration of medicines, and that in that act of passage of substances through the cell walls, a change takes place, which we can not at present understand—which is nothing new, and to that part of it, I desire to say, Dr. A. has no claim whatever as the authorship of the idea.

The paper read said but little on the subject of epethelial changes. Indeed, I believe, it took the position that but little could be hoped for in the way of change in the tissues after birth—in the dental structure, if you please.

I desire to place myself upon the record as distinctly opposed to that theory.

A MEMBER: It was after adult age.

DR. BARKER: Well, I maintain that by using the proper substances, under favorable circumstances, and some times under unfavorable circumstances, we may hope for good results. I will here mention a case which I have now under treatment, illustrative of that point. A young lady, just previous to marriage, came to my office and had her mouth thoroughly examined. I found her teeth in perfect order, with no cavities of decay. She married, and about a year afterwards gave birth to a child. A few months after the birth of the first child, she again became *enciente*, and the physician allowed her to continue the process of lactation nearly up to the birth of the second child. Some few months after the birth of her second child, she came into my office, and I found the fillings in her teeth in such a condition that I could remove them with a hair-probe, and I found that I could take an excavator and cut the teeth anywhere, almost as I would cut cheese.

Now, what was I to do? The patient was in a very fair state of health, and I concluded, after a careful consideration of the matter, that I should be doing that patient an injury if I performed for her any service but that of a temporary character. Therefore, I relied wholly upon Hill's stopping, and waited for time to consolidate and improve the tooth structure, which I felt certain it would, under proper treatment. I made use of the lactophosphate of lime, one of the best agents I know of in such cases. I prescribed three tablespoonfuls daily. This treatment has now continued for some time, and I find a marked improvement in those teeth.

In view of this case alone, I think the paper takes a very unjust position when it asserts that we can not improve tooth structure by treatment. We all know that consolidation of tissues and dental structure takes place after adult life. We find a marked change—the teeth growing harder as men grow older, just as other tissues change. In youth the balance is in favor of supply. In middle life the balance is perfect. As we advance in age we have consolidation of structure, and the balance is in favor of waste.

DR. DIXON: I wish to subscribe heartily to what Dr. Barker has said in reference to changes taking place after adult life.

I think one of the duties most incumbent upon dentists is to observe the changes which occur, not only soon after adult life, but all through life. I could instance some cases of this kind, which would startle men who never considered this subject. I have made it a point to consider it through my professional career, and the more I have considered it the more I am convinced that these changes take place at all periods of life, and sometimes with a startling rapidity. Teeth which at one period of life I have found solid and enduring, within three months of that time I have found to succumb to decay. This is something which ought not to be and cannot be ignored by dental practitioners.

DR. BARKER: Have you had any experience in hypo-phosphites?

DR. DIXON: No, sir, not sufficient to make it instructive or interesting to this body.

DR. J. S. SMITH (Columbia, Pa.): I think the proper understanding and development of this subject of therapeutics will, at no distant day, have a marked influence in perfecting a better natural denture than we have at present.

Through systematic treatment by therapeutic agents, it is possible that the future dentist may be able most successfully to deal with degeneration in dental tissue. In fact, there are those now, in the infancy of our profession almost, who are employing therapeutic agencies with this end in view. It is becoming quite general now to prescribe lacto-phosphate of lime to the prospective mother. This is done, as I understand it, with a two-fold purpose: that of building up pabulum in both mother and child. It requires time, however, to build up an improved tissue; therefore, success must not be looked for too speedily.

When a person is treated by a physician for softening of the bones, the usual remedy is bone phosphates, and in due time nutrition takes place, and there is a restoration of what has been broken down through hereditary or natural causes.

There is another very valuable therapeutic agent which has not been mentioned here: common lime water. It may be taken with milk, and be readily assimilated by the system.

DR. DEAN: It may be well known to this body that arsenic has, of late, received a good deal of attention, not only in this country, but abroad, as an antiseptic. I have noticed in the discussions of the Odontological Society, of N. Y., some remarks by Prof. Flagg, that surprised me much, because I had supposed that arsenic did not possess the properties which he ascribed to it. A number of years ago I took a quantity of fresh veal, and cut off a piece perhaps a quarter of an inch in diameter, placed it in a bottle and covered it with white arsenic freely. Some ten days after, it became very offensive from putrefaction. About the same time, I took a piece of similar size, placed it in a bottle, and covered it with glycerine. The result was that the one to which the arsenic was applied became very offensive, while the other seemed to be free from putrefaction. I then took three pigeons. To one of these I gave two grains of arsenic internally. To another I gave four grains. The one to which I gave four grains died in about eight or ten hours; the one to which I gave two grains lived a little longer. I then killed the other pigeon, and sent them all into the country, where they were hung up in a shed, so as not to be exposed to the sun or rain. The one free from arsenic showed no signs of putrefaction for about six days, but on the seventh day gave evidence of decomposition. The others stood it out for three or four days and then succumbed.

Not being familiar with frog experimentation, I got another gentleman to experiment on a couple of frogs. He took two grains of arsenic and rubbed it on the inside of the thighs of one of these frogs. Two days afterwards he inserted one grain of arsenic into its thigh, which he bound up, and four days afterwards he stripped out the foot and placed a grain of arsenic on the web. This frog lived about six days. After he died, the Dr. took one of his thighs and had it subjected to analysis. No arsenic was found in the thigh of the frog. The other thigh was placed in a shady place, and it became so offensive that he was obliged to throw it away in about twenty-four hours.

The other experiment was with a frog, where the arsenic was administered internally. This frog was given two grains of arsenic at the first dose, and two days afterwards one more grain of arsenic was given, and about four days afterwards we gave him Fowler's solution. On the sixth day the frog yielded to these remedies.

I was mistaken in what I said in regard to the leg of the other frog. It was not submitted to analysis, but in the viscera of that frog—the one to which the arsenic was applied externally—there were found crystals of

arsenic, but the viscera from which this arsenic was obtained became very offensive from decomposition, in the course of twenty-four or thirty-six hours. The frog, when the legs and viscera were removed, being placed on the ledge of a window having a southern aspect, dried up in a few days, without any signs of putrefaction. The other frog was placed on a window sill with his viscera in him, and he also dried up without any signs of putrefaction.

DR. HUNT: I am very glad that Prof. Barker has started the question of the waste and repair of teeth.

I wish to speak particularly with reference to the therapeutic agents we use. Prof. Barker mentioned lacto-phosphate of lime. That is probably one of the best forms in which we can get the material. With our present knowledge of chemistry we can not, in the laboratory, place any article of food or any article of therapeutics in a proper and perfect condition for assimilation into the human body. The only way in which we can get these ant-acid therapeutic agents, which are taken internally and act through the circulation in a perfectly assimilable condition, is to have them first passed through the laboratory of nature before we use them. And in the use of our therapeutic agents, if we will direct our attention to bringing them into that condition which is most closely allied to the products of nature, either in the vegetable or animal kingdom, the more nearly will we attain success in their use. If we desire to arrive at correct conclusions we must follow out the process from effect to cause.

Dr. Flagg has been referred to as taking a certain position, which I think is not thoroughly understood by this body, and as he is not here, I am willing to speak for him as best I can. The position he assumes is this: that in the application of arsenic it is not imperative to remove it at any given time, for fear of having absorption ensue. It may be left indefinitely, without giving any systemic or local disturbance. If a certain amount of arsenic is absorbed, for instance, into the pulp by endosmosis, and acts on the cells there exclusively, it has only a local influence. I think myself that it does act systemically.

A MEMBER: How about preserving frogs?

DR. HUNT: The taxidermists use arsenic extensively in the preparation of birds, and the object is this: to secure a union of the arsenic (perhaps not a chemical union) with the tissues of the body; but we all know that arsenic, when administered in certain forms, locally, does seem to act locally. Quacks in our part of the country frequently advertise to cure cancer without the application of a knife, and they use for this purpose what we call arsenical paste. We have in such cases the best evidence that

such an application is merely local. Its influence is systemic only when a moderate quantity is applied; in other words, it is perfectly safe to make an application of fifteen or twenty grains locally, when one or two grains similarly applied would produce systemic action.

DR. KINGSBURY: It has been remarked that the waste and repair of the teeth is a mooted point. For my part I see no reason why it should not be regarded as a well established fact.

We know that the elements for the repair of broken down tissue are transported by the arterial circulation, while the worn-out elements are carried out and ejected from the system by means of the venous circulation. We know that the pulp of a tooth possesses arterial and venous circulation, and I see no reason why it should not be subject to the same processes as take place in regard to the general system.

Now, in regard to the best material for the repair of a deteriorated condition of the teeth. I had prepared, a number of years ago, a hypophosphite in the form of a syrup. I had it prepared to test its effect in improving the structure of teeth which seemed to be extremely deficient in lime salts. I administered it faithfully for quite a length of time, and I must confess that I came to the conclusion that the phosphates of lime in that form were not assimilable. The result disappointed me. I think those elements of food which tend most directly to build up the general system, are best adapted to improve the structural character of the teeth.

DR. JOHN ALLEN: I think that where we can employ therapeutic agents directly from nature's laboratory, we are more sure of good results than where we rely upon those substances from the laboratory of man. For example: in the diamond, a product of nature, we have absolutely pure carbon; but show me a man who can take pure carbon and reproduce a diamond. I am aware there are those who think they can supply the want of the phosphates of the food in other forms. I am quite positive, from experience and observation, that it is far better for us to rely upon natural substances than upon artificial compounds. For instance, let us take the phosphate of lime, just as nature produces it in the hull of the grain. I have far more confidence in such a method of practice than I have in the use of drugs.

REPORT

ON

MECHANICAL DENTISTRY.

BY W. N. MORRISON, CHAIRMAN.

As an individual member of your committee on mechanical dentistry, I beg leave to present the pinless porcelain tooth, the *exact* shape and size of nature's own productions, recently patented by Dr. Wm. P. Hall, of Piqua, Ohio. The specimens herewith presented will explain themselves, and every one will readily recognize that these shapes are what we have long and earnestly desired. We want teeth resembling nature, as much as can be produced, in shape, color, and *good masticating surfaces*, particularly in bicuspids and molars, whatever they may cost. Our object should not be to buy so many teeth for so much money, regardless of how well they may imitate nature's own productions or subserve the high offices of enunciation, mastication, etc.

There are some slight obstacles to be overcome by manufacturers in the production of these new shapes, particularly with regard to color; but we sincerely hope not more formidable than those in the production of the old specimens, with which we have so long compromised our professional and artistic dignity, thereby making every dentist ashamed to own that he pretended to be a mechanical dentist, or did artificial work of *any* kind.

From all that I have been able to learn, the relative value of the different bases remains in the same order as heretofore. They have been so ably reported upon by our erudite chairman of last year, that the west has nothing new on this subject to offer.

REPORT

ON

MECHANICAL DENTISTRY.

BY W. C. BARRETT, OF THE COMMITTEE.

(CHEAP BASES FOR ARTIFICIAL TEETH.)

In the choice of the material for the base of an artificial denture, a number of things must be considered, not the least of which, in the estimation of the greater part of our people, is the cost. If in the absence of the natural teeth, artificial substitutes are a blessing, it should be our aim to place them within the reach of the laboring man, who must in this be governed by the laws which dominate him in supplying his other wants. If he cannot for the dress of his wife or daughters afford silk, he must perforce content himself with cotton. It is not perhaps as durable, or as ornamental as satin, but it has for him the allurement of being within his reach. It may not be charming, but it is cheap. In the choice of materials for his wife's or daughter's teeth, the same rule must govern his action. We are not all rich, nor can all dentists work for rich patients. The necessities of the poor are none the less imperious because of their poverty, but they call upon us for an effort to place indispensable things within their reach. Our most skillful and best appreciated dentists might, so far as their usefulness to the lower classes is concerned, as well be translated to another sphere. The calico dress of the artisan's wife is not the best kind of a dress, but it serves her necessities and covers her nakedness, while it is within the means of her husband. Some merchants, perhaps, keep no other goods than silks and satins and velvets, but for one such, there must be ten who deal mainly in ginghams and calicoes. The greater proportion of our people must con

fine themselves to necessities, and choose but the cheaper of indispensables. If we as a profession would fulfil our mission, we must recognize all the conditions, and strive to conform ourselves thereto.

There is, then, a demand for some cheap base for artificial teeth, that the wants of those whose necessities are as great, but whose ability to pay is more limited, may be supplied. Many efforts have been made to minister to this imperative demand. Various combinations of base metals, diverse compounds, and medleys of incongruous ingredients have been offered. Our hopes have been excited through impracticable metals, and by moonshine schemes to fabricate the finest silk purses from the commonest sow's ears. It was not till the advent of caoutchouc or rubber, that a step seemed to have been taken toward the desired end. But with even this material, it was soon found that the dental millennium had not been quite reached. Rubber was liable to certain objections inherent in the material itself. But though it did not promise to supply the demands of artistic dentistry, in the hands of competent men it has subserved a useful purpose. It is not silk, but it has been made to do very well as cotton. Unfortunately, its very cheapness and ease of manipulation, while putting artificial teeth within the reach of all, has also brought into dentistry an entirely new class of dentists, to supply the greatly increased demand. These new-fledged professional men, with their little carpet-bags, have perambulated the country in all directions, and carried their wares to every door. They have worked for a mere pittance, and their accomplishments have been confined to the wholesale extraction of natural teeth, and the insertion of poor artificial substitutes. While they have thus wrought much mischief, they have for all time established the certainty of cheap dentistry. However much we may deplore this, and sigh for the good old days of gold and high prices, we must accept the present condition of dentistry among the masses, and as true men—lovers of our profession and of mankind, endeavor to bring about a more healthy state of affairs.

Rubber has been enthroned as the modern Jack Cade—king of the mob. In the minds of many, it is not worthy this position. It has, like many another monarch, fallen completely under the influence and domination of its prime minister—Bacon—that power behind the throne, greater than the throne itself. So firmly has he entrenched himself, as to defy our utmost efforts for his dislodgement. By virtue of the tinsel crown and cheap prerogatives of the patented monarch, this wicked minister has seized upon and sequestered to himself all revenues. Most oppressive taxation has, without our consent, been levied upon us. The royal monopolies have become so great as to be intolerable. We have struggled to rid the cheap monarch of this malign influence, but to no purpose. We have petitioned, we have remonstrated in vain. "Our petitions have been slighted, our remonstrances have brought us additional insult and injury, and we have

been spurned with contempt from the foot of the throne." We have resisted taxation, and our goods have been seized upon in this mock king's name, and our estates have been sequestered. There remains then for us nothing but the dethronement of the monarch himself.

To drop the figure and descend from the realm of cheap rhetoric: In the selection of a cheap base, we should choose that which is liable to the fewest objections. For all practical purposes, there are but two to elect from—rubber, and its powerful rival, celluloid. Let us compare the one with the other, that we may the more intelligently select.

Organically, there is but little difference between them. Both are nearly related to protoplasmic matter, being severally but a single step removed from inorganism. The one is an exudation—a gum—the other the partially organized product of vegetable function—cellulose. In some of their characteristics they widely differ. Both maybe molded in a matrix; but the one is solidified, made stable by the application of caloric, while the other is rendered plastic by the same process. Of the method of the preparation or manipulation of either, it is unnecessary to speak. We will consider their various properties in their several relations to dentistry—their density, solidity, tenacity, weight, cleanliness, conductivity, ease of manipulation, adaptability, expense, destructibility, beauty, and congeniality.

In density, impenetrability, neither has much the advantage. There is an impression that celluloid is porous, and likely to absorb the fluids of the mouth; and as to much of the material furnished dentists, the objection is valid. But when this is the case, the fault is undoubtedly with the manufacturers.

In hardness, solidity, rubber is the superior.

In tenacity, strength, celluloid has considerably the advantage. This is an important qualification, and is amply proved, not only by mechanical tests, but by the manner in which the material resists even change of form. Superadded to its superior tenacity, is its greater elasticity.

Rubber is the heavier of the two. This is sometimes an advantage, and at other times an objection.

In cleanliness, there is little to choose between them. Both being molded about the teeth, and neither, when properly manipulated, being greatly liable to shrink or draw from them, there is very little opportunity for the deposit of matter which can not be readily removed. Their powers for transmitting caloric are nearly equal. Both are poor conductors, and herein lies one of the chief objections to the use of either.

In ease and pleasantness of manipulation, celluloid has considerable advantage. That is, it is more quickly and pleasantly worked by the skilled dentist. Doubtless rubber presents fewer obstacles to the bungler. Cellu-

loid requires a higher mechanical ability, but is more easily manipulated by the expert.

In adaptability, there is little to choose. Both, as now worked, most readily adapt themselves to the conformation of the mouth, and retain the permanent shape given them, the one about as the other.

The cost of each, taking into the account patent royalties, is about the same.

In durability, there has not been as yet sufficient time to fully test their rival merits. An experience of two years warrants the impression that with perfect material celluloid will not be inferior. But too many of the blanks sent out, have been of such inferior quality as to furnish no fair test. Unless greater uniformity in the results of the manufacturers be attained, the palm of superiority must be given rubber.

In appearance, celluloid has immense advantages. Its color is immeasurably better than that of rubber, and when perfect blanks have been procurable, it has not been found that it changes materially with use. It is quite possible with this base to use plain teeth, carving the gum into a close imitation of nature, restoring lost contour, and breaking up the detestable monotony and mechanical appearance presented by gum sections. In this quality it is inferior to continuous gum work, but occupies a station about midway between that and rubber.

In congeniality, whether to the mucous membrane of the patient, or the feelings of the dentist, there is almost no comparison. This is an important point. The immediate and continuous contact of any unsympathetic foreign substance with the delicate mucous membrane of the mouth, may be, and doubtless often is, the cause of serious disturbances. From its very nature, rubber is unsuited for close adaptation to delicate tissues. We all know how uncomfortable is a rubber shoe, or glove, or other close-fitting garment, and this, too, aside from the imperviousness which prevents evaporation from the skin. It is irritating and inflammatory. Vulcanization doubtless reduces this baleful characteristic, but does not destroy its incompatibility. From these objections celluloid seems to be free. Red rubber also contains a large amount of vermilion, used as coloring matter. While this, perhaps, may not mean free mercury in the texture of the vulcanized product, it cannot be denied that it increases the tendency of the plate to irritate, and makes it less congenial to the tissues of the mouth. Celluloid contains but a minute proportion of this pigment, and has therein undoubted superiority.

The objections urged against this base are, its alleged change of color, its occasional absorption of the fluids of the mouth, and its warping when not in actual wear. The complaints of failures in manipulation are, by the awkward, urged against every other base, and may doubtless fairly be at-

tributed to lack of skill. But the charge of lack of stability in the material is a graver one, and if fairly proven is fatal. Celluloid resists the action of most acids, occupying about the same place in this particular as rubber. When properly prepared, it is not more porous, and experience has shown that perfect plates of celluloid are, in impenetrability and fixedness of color, but little more faulty than is rubber. If there be any advantage, it is undoubtedly upon the side of the latter. It is believed that under favorable circumstances, celluloid will be found free, or nearly so, from these objections. The charge of warping, or springing, has been proven to be unsustained. A plate has for months been constantly subjected to the most violent changes of temperature, without, at the end of that time, having been found to be changed at all, though during the whole time it had not once been put in the mouth, or placed on its proper cast.

It is a great pity that the celluloid company has not exercised greater care in the sending out of blanks. Many that are imperfect, of bad color, and only partially cured, have been thrown upon the market. These have mainly fallen into the hands of dentists inexperienced in the use of the material, and therefore incompetent to select good blanks. Dentists, too, living at a distance from the dental depots and ordering from them, are apt to get poor plates, and thus the base itself is brought into disrepute. The demand for celluloid has been, at times, beyond the ability of the company to supply, and this doubtless accounts for their failure to, in all cases, condemn imperfect material. It is hoped that in the future prudence will dictate to the vendors of a commodity which they desire should be brought into common use, that at least its reputation should be firmly established, before the standard be allowed to deteriorate.

But taking into view all its comparative qualities, and leaving out of the consideration the question of its freeing the profession from the detestable rubber monopoly, the conclusion is inevitable, that celluloid has the potentialities which should dethrone rubber, and establish it as the best of the cheap bases for artificial teeth.

REPORT

OF THE

COMMITTEE ON ETIOLOGY.

BY D. C. HAWXHURST, CHAIRMAN.

I wish to call your attention to a remarkable process of retrograde heredity that is now working changes in the maxillæ and teeth of mankind. In it I believe that we shall find a curious cause of dental infirmity.

It is no new observation that the jaws of civilized races have suffered a notable diminution during their passage from the savage state. Dr. J. H. McQuillen called the attention of the profession to this fact in the Dental Cosmos some years ago.

Changes in the maxillæ of the human race, within the historic period, have been noted by Herbert Spencer, in his Biology (vol 1, p. 455). Examining the collection of skulls in the College of Surgeons of London, he found the jaws of cultivated races invariably smaller than those of savage races. An English under jaw, when compared with that of an Australian or negro, proved to be both lighter and smaller—not alone in absolute weight; it was lighter and smaller when compared with the rest of the skeleton. A modern English jaw was found to be much smaller than the ancient.

I have myself verified these observations by an examination of Morton's collection of skulls in the Academy of Natural Sciences, in Philadelphia. In this collection the Indian, the negro, the Fejee Islander and many other races are represented, and invariably present larger jaws than those of the Anglo-Saxon. In the Steere collection of South American Indian skulls, in the University of Michigan, I have also found the same strong contrast between the jaws of savage and civilized races.

The fact above pointed out having been ascertained, a multitude of interesting questions spontaneously arise, which I have no time to entertain. That which interests us most is the influence which this diminution in the size and weight of the jaws has had upon the teeth. Embryological studies prove that retrograde evolution of the teeth has been pushed to great extremes in some of the animal species. That the teeth of mankind, as well as their jaws, have undergone changes of external size and configuration, there is abundant evidence.

But before noting the precise character and amount of influence exercised by retrograde heredity over the teeth, it will be interesting to pause for a moment to consider a question that is preliminary, and one out of which grow important results. Will the teeth feel the influence of dimished maxillary function as early in the career of a race as the jaws will, and will they fall backward in size as rapidly? Such a question would be impertinent to the subject, if but moderate periods of time were to be taken into account. But in considering a period so extended as that which fills the gap between savageism and the civilized state, it becomes of high importance, since an effect which is so insignificant as to escape observation in a single generation may, with the lapse of ages, roll up a cumulative result that shall compel recognition. The question may be again stated as follows: In a race that is becoming civilized and undergoing retrograde evolution of the jaws and facial bones, will the teeth dwindle as promptly as the jaws and soft parts? Certainly they will not. *The teeth will fall behind* in this process of adaptation to changed function, and *will remain somewhat too large for the maxillæ.* For proof that this *has* been the case, I refer you to a comparison of ancient and modern skulls, and to a comparison of living savages and their cotemporary civilized races. (See also Darwin's Descent of Man, vol. 1, p. 121).

The fact that there has been a disproportionate change of teeth and maxillæ chiefly concerns us here, and not the reason for it; but I will hazard an explanation. It must be remembered that although soft parts and even bones may be reduced in size by lessened function, the teeth are not thus easily modified after they are mature. In the maxillæ as in the soft parts, a first result of diminished exercise is a corresponding decline of activity in the processes of assimilation and tissue building. A lessened density and perfection of tissue results. Following close upon this is diminution in size, as a result of the ever present retrograde metamorphosis. And this in a measure *restores* the *disturbed qualitative integrity.* If vital activities are lessened, the space which they occupy is correspondingly restricted.

But the tissues of the teeth are not as easily moulded to a changed condition of vital currents as bone. Their hard tissues are less pliant to transient conditions. They are therefore transmitted to the succeeding generation, without having been as much influenced by environment as the max-

illæ. This disproportionate rate of change, maintaining itself during the lapse of ages, gives us as the cumulative result or sum of the effect wrought in each generation, a total disturbance of harmony in the size of teeth and maxillæ that is capable of entailing grave consequences.

Up to this point I have done little more than place on record the single fact that the teeth in civilized races are disproportionately large when compared with the maxillæ, and to point out how this state of things has come about. Two important results remain to be noted:

1. What is the effect of this diminished maxillary capacity, combined with an undiminished dental arch, on the dentes sapientiæ. The maxillæ being of insufficient size, the teeth last to take their place, the third molars are erupted with difficulty and do not rise in the jaw, but are obliged to travel forward in order to see the light, as coming from a part of the jaw that ought to have been brought forward by normal growth and evolution of the maxillæ. Thus the wisdom teeth "seem to have no place in the modern jaw." In the savage races there is enough room for them, and in the anthropomorphous apes a surplus. Indeed there is space enough in the maxillæ of the orang to permit the eruption of the third molar at the thirteenth year, soon after the second has appeared, and in serial order with it. This was no doubt the period of eruption for this tooth in mankind at a remote time, but the modern jaw at the age of thirteen is fully occupied, and some years of backward growth and elongation must elapse before the third and last molar can be added to the arch.

And when this tooth at last appears, its eruption is tediously slow; it is attended with inflammation, sometimes great swelling and suppuration. This is especially true of the inferior *dens sapiens*, which, not being brought forward from beneath the base of the coronoid process by maxillary development, often erupts upward into the ramus as taking the direction of least resistance. And when it erupts in its normal position, it escapes from its bed with great difficulty. It is also small, and in a large per centage of cases is absent entirely.

Mr. Weiss, of the Odontological Society of London, has recorded the condition of the wisdom teeth in a considerable number of cases. He made his observations subsequent to the twenty-sixth year, rejecting all doubtful cases. Of all the cases examined by Mr. Weiss, twelve per cent. had never had the third molars. Nearly fifty per cent. had not erupted the full number.

None of the other teeth have been so much affected by the disproportionate development of teeth and jaws, as the third molars. No doubt the reason is that this tooth erupts subsequently to the other teeth, and after they have possessed themselves of the available space.

When it is remembered that the wisdom teeth of the savage are comparatively large, and that those of the anthropomorphous apes are as large as

the other molars, it will be seen that some causative agency has, from an extended period, been acting on this tooth, and that it has made a profound impression upon it.

What then is this agency? Whatever it is, it is something that arises out of the disproportionate reduction in size of the jaws and teeth above mentioned, by which the latter are at this time relatively too large. What then has this agency accomplished in the wisdom tooth? It has dwarfed its crown and reduced the number of its roots. It has rendered eruption difficult, painful and often impossible. It has effected a postponement of its period of eruption to the extent of five years or more, and in a constantly increasing per centage of cases it has altogether suppressed it.

These facts indicate that this tooth is being slowly reduced by retrograde evolution to the condition of a rudiment. That its present cramped struggle for existence may end in its entire suppression at some remote period of the future, is not improbable. That it has been affected very differently from the other teeth by the diminution of the maxillæ, is no doubt due to its position and relative time of eruption. Lying in an osseous cell, whose walls are thick and unyielding, and not coming forward by maxillary evolution, it has had to erupt into whatever space was left for it, after the demands of the other teeth for space were satisfied.

In speaking of a disproportionate development between the jaws and the teeth, I have referred to reactions between the organs of mastication and their environment, which have no doubt been in progress during many thousands of years. I have not meant to refer to that disparity which Dr. Chase has set forth as a consequence of the marriage of German males with Anglo-American females. In that particular instance, as Dr. Chase has pointed out, we have a transient cause of disproportion between maxillæ and teeth, which is a curious result of cross-breeding. (See Dental Cosmos for June, 1876, p. 308.) The disparity to which I allude is the result of a tardier adaptation of teeth to lessened function than of maxillæ to lessened function. Having considered the effect of this state of things on the wisdom teeth, let us look to its effect on the rest of the organs. Dr. Chase has already pointed out the damaging effects of abnormal contact and excess of pressure, causing mechanical injury to the enamel of young teeth and interfering with spontaneous cleansing of the organs, whether young or mature. (See Dental Cosmos for June, '76, p. 308.) After indicating their place in the series of effects I leave these topics untouched.

The second result to which I wish particularly to direct attention, is frailty of structure and weakened vitality of the dental tissues. If the tooth could, like the jaw, shrink to correspond with the ebb of its vital currents, it might retain the primitive integrity of its tissues. But though it can not respond at once in size, it can to some degree in structure. And

it responds in structure a long way in advance of any changes in external size. This is the order of retrograde change in a muscle or other soft part that diminishes from lessened function. First internal or molecular changes, then a falling together of the easily yielding parts. Thus the external size and configuration are modified. But this can not take place in the tooth, the hard part can not contract down on wasting soft parts. Nevertheless, the pulp and fibrillæ of the tooth will change and they will affect an interstitial modification of the hard tissues that they lie in contact with. Thus the structure is impaired; the quality of the tissue is reduced. Dentine and enamel come thus to have a lowered vital endowment, and histological function is out of correllation with histological structure.

Without speculating on the future, it is enough to say that the tardier response of the teeth to lessened functions, as compared with the ready adjustment of structure to function in the jaws, has, I believe, had something to do with the establishment of that carious tendency in the teeth of civilized races, which is so universal.

Much remains unsaid. I have been able to set forth but the barest hint of my meaning. There is some confirmatory matter which there is no time to present to you on this occasion. Nor must it be supposed that I advance these views as any thing more than a small contribution to the etiology of a great subject.

REPORT

ON

ETIOLOGY.

By MARSHALL H. WEBB, a member of the Committee.

Throughout nature all parts of an organism are in a physiological condition—in a state of "ease"—when the function of an organ is not interfered with, or when nutrition is not perfected; but if nutriment be not rich and abundant and functioning be not normal, a *pathological* condition is brought about—a "*dis*-eased" condition follows. Etiology is that department of science which treats of the causes of disease.

The atoms may not combine perfectly and the cells may not produce absolutely normal tissues throughout the organs of a system, hence a *predisposing* cause of disease is established, and through the influence or action of an agent which operates as an *exciting* cause, a manifestation of a diseased condition is usually first observed in or about such imperfectly developed tissue.

Imperfect development cannot be better seen than in the dental tissues. If, for instance, a section of enamel be prepared and placed in the field of the microscope, there may be observed a fissure extending from a sulcus almost or quite through the plate of such enamel, as the result of an imperfect combination of the elements of this tissue. A specimen such as this was presented to Dr. J. H. McQuillen by Dr. R. W. Varney. This specimen was beautifully illustrated, and such fissures, together with the inter-globular spaces (which were also shown in the specimen) described by Dr. McQuillen, in a paper entitled, "Microscopical Fissures in the Masticating Surfaces of Molars and Bicuspids," published in the Dental Cosmos, vol. 13,

page 300, 1871. Dr. McQuillen regards the inter-globular spaces as "a predisposing cause of decay."

Into a fissure, such as referred to, microscopic though it may be, particles of food become impacted during mastication, acids are formed, and act as a cause of caries. Such a result may follow at all those points where foreign substances are held in contact with tissue a sufficient time for putrescence to occur.

The discoveries thus far made and observations noted by Dr. S. B. Palmer in relation to the etiology of dental caries, seem to justify the inference that "Acid forms salts with the substance of the tooth, which salts are at once decomposed by agents found in the saliva, and thus the same polarity is maintained and decay continues so long as the conditions which induce it remain the same;" decay of the black variety being arrested, if "the salts formed by decomposition of the mineral portions of the tooth are insoluble, and become polarized in a negative position to the decomposing agent;" or, as in the white and other varieties, decay may be arrested "by preventing access of the corroding agent to the part;" * * * "this end may be attained by filling."

Through the continuous presence of agents which bring about chemical action, especially upon tissue where the combination of the elements (the phosphates) has been imperfect, or where such combination has been interfered with, this disintegration, if not checked or retarded, reaches the pulp, when disease—irritation—of this tissue is caused by influences operating through the cavity of decay thus formed.

When dentinal caries has advanced this far, and the finely-formed, intricately arranged and very sensitive pulp-tissue is, in the manner indicated, so encroached upon as to cause it to be in a diseased condition, all this prompts consideration in relation to the etiology of the various phases of odontalgia.

Irritation of pulps may be brought about, not only by the agents which cause disintegration of the hard tissues—the enamel and dentine—but more especially by the impingement of foreign substances or carious dentine upon the exposed, or nearly exposed tissue.

If irritation of the pulp be caused by the acid condition concomitant with the active carious process, such irritation should subside upon the changing of this condition—upon the cleansing out of the cavity by the injection of tepid salt water, and especially after the removal of the softer portions of carious dentine and the application of an alkali, such as the bicarbonate of soda. Should the exposed, or nearly exposed, tissue be impinged upon by disintegrated dentine, or a foreign substance which has been forced, during mastication, to so impinge, the irritation thus induced should subside after

the removal of such cause. Where thermal changes cause irritation, and the parts have been treated as indicated, a non-conducting substance should be placed over the part affected, so that fluids cannot approach it.

If an irritant be not removed, or if the agents which bring about the disintegrative and destructive process be not counteracted or made inoperative, the irritation becomes so pronounced as to cause the brain to take cognizance of the pain induced.

Where agencies such as stated continue to operate, pathological irritation of pulp-tissue will not only be indicated by occasional manifestations of pain, but upon the exposure of a part of such tissue, another phase of odontalgia will be noticed—more intense pain may follow—because of the influence exerted by the agents concerned in the causation of the devastation thus far produced; these agents also interfering with the due supply or perfect appropriation of nutritive plasma.

Owing to such interference, cognizable disease ensues, and if the cause or causes inducing it be not removed, the parts cleansed and perfect ease established, devitalization of the pulp eventually follows, accompanied by the occurrence and recurrence of odontalgia partially or fully pronounced.

Some derangement of the pericementum is induced through the devitalization of the pulp, but this is simply evanescent, particularly if the devitalized pulp-tissue be at once removed. The parts of the vessels which are ruptured at the apical foramen when the pulp is removed soon collapse; the blood conveying the nutritive supply for the tissue destroyed, transports it to other pulps or parts; the extravasated fluid remaining about the end of the root or roots, as the result of the rupture of the vessels, is gradually absorbed, and a tolerable condition again established.

Devitalized tissue soon disintegrates and becomes putrescent, and the sulphureted or phosphoreted hydrogen gas arising from such putrescent matter has an irritating influence upon adjacent soft tissue. Should pulp-tissue be not removed soon after its devitalization, or before putrescence follows, gas may escape through the apical foramen (especially if the cavity of decay, in any manner, be closed), and irritate the tissue surrounding the end of the root. This irritation may be caused, not only by such gas, but also by particles of disintegrated tissue, or any matter which may be forced through the foramen while such putrescent tissue is being removed in the cleansing of the pulp chamber.

When gas, emanating from putrescing and disintegrating pulp-tissue, escapes through the apical foramen, nutrition of the elements of the tissues about the apex of the root is interfered with; a separation of tissue or cells is caused by this gas, which gas is absorbed by the watery fluids exuding from adjoining capillaries and the inception of alveolar abscess is thus pronounced.

Dr. W. H. Atkinson has well said, in this connection, that "The contents of the abscess may now be absorbed, and the disrupted tissues again unite, with or without an intermediate stratum of coagulum. If all the extravasated fluid has been taken away, this is an example of most complete resolution (union by first intention.) If coaptation of the lesion has a very thin stratum of coagulable lymph still left between the parts, we have the next best example of resolution, still 'union by first intention.' But if the contents are too much soured by the absorption of the gas to confer upon them the degree of similarity (dissimilarity ?) of tension of molecular currents to favor the dyalissis (dialysis ?) [passage through the wall of the abscess and wall of adjacent capillaries], the process is repeated at the junction of abscess and tissue exactly as before stated, and we have, first, dissociation of atoms; second, formation of gas, etc. And now another opportunity for absorption (resolution) is presented, and the abscess may disappear, leaving an insoluable mass of collapsed epithelial scales, caseous corpuscles, or other insoluble constituents of pabulum that may become encysted and tolerated indefinitely. Or the changes enumerated may be so rapid as to infiltrate all the intercellular territory of the locality with coagulable lymph, so as to literally choke off all neural and vascular circulation to the involved territory, when stony hardness of the part ensues and lays the foundation of phlegmon, acute or chronic, or tumor, benign or malignant, according to constitutional and other conditions."

If conditions be such that resolution can not take place—if there be an accumulation of disorganized or pus-corpuscles—distention of the parts takes place and, because of such presence, induces severe pain and absorption (solution) of the alveolar process; all which continues until the conte ts of the sac are discharged, either through such alveolar process or the apical foramen.

So long as putrescent tissue is allowed to remain in the pulp chamber, and the mephitic gas arising therefrom escapes through the apical foramen, so long may abscess periodically take place—so long as the cause is not removed, so long may such result follow. A continuance of such pathological phenomenon may result in an almost constant pus-generating surface along the inner part of the sac, which, also, doubtless becomes far more firm in texture than when the abscess first developed within it. It is quite difficult to get rid of this suppurating surface, and to eradicate or make the sac assume such a condition as to favor the establishment of a physiological state in the adjacent parts; but if this is not brought about, a manifestation of disease known as chronic abscess is the result.

While irritation and even inflammation of a part or the whole of the pericementum is concomitant with the diseased conditions thus far referred to, yet its vitality is not notably lessened until the establishment of chronic or erratic alveolar abscess. This condition interferes with the supply

of the elements upon which the membrane, and the cementum which it envelopes, depends for nourishment, and in consequence of this, and the irritation kept up through the chronic abscess, the vitality of the peri-cementnm and cementum is finally destroyed, and then, and not until then, all the tissues of the organ—the tooth—are in a necrosed or non-vital condition.

The vitality of the membrane (periosteum) lining the socket of the tooth, may also be destroyed, and necrosis of the surrounding or adjacent alveolar process, and even of a portion, at least, of the maxillary bone, may ensue; the antrum may be invaded so as to bring about a diseased condition within it, and still further complications may arise because of a continued action and advanced stage of chronic alveolar abscess, unless a line of demarkation be made by nature, and the cause or causes inducing all the abnormal conditions be removed.

REPORT

ON

DENTAL ETIOLOGY.

By H. L. SAGE, of the committee.

Etiology is the science which treats of the causes of morbid phenomena in general, and pathology the science of diseased conditions—that which treats of the nature of disease.

Etiology in its relation to the dental tissues, is usually restricted to a consideration of those agencies and morbid conditions which are excitants and predisponents of the affection denominated dental caries, though evidently it may have a wider signification. Inflammatory action in pulp, or periosteal tissue, or the organic constituents of the dentine and cementum, are pathological conditions which may exist without the manifestation of dental caries as an exciting cause, though the former may be a predisponent of the latter by the impairment of vitality or the lessening of vital resistance in the dental organs, thus rendering them more susceptible to the action of external chemical agents.

On the other hand, caries may be an excitant of inflammation or of other morbid phenomena in the dental and contiguous tissues.

Abrasion, whether spontaneous or mechanical, though not strictly a disease of itself, may be an exciting cause of disease, and this may also be said of undue acidity or alkalinity of the secretions of the mouth—of salivary deposits of calculi and of other influences acting externally. A depraved or anæmic condition of the system, nervous disturbance, etc., may be predisposing causes of dental disease. In fact, systemic conditions are greatly influential in the maintenance or impairment of a normal condition of the teeth, gums and alveolar processes.

But the causes of disease in the dental organs being divided into predisposing and exciting, or, in other terms, vital and chemical, more particular reference is had in the former case, to imperfect structural development of the teeth at periods prior to their eruption, and in the latter, to the influence subsequent thereto of external chemical agents which, acting upon the enamel and dentine causes their disintegration or decalcification—to which may be added the more recent theory of parasitic influences; but whether a cause or an effect of caries, has not been fully determined by scientific investigation, though the weight of opinion seems to be that these organisms are merely an accompaniment, whose growth is favored by the presence of acid secretions, a want of cleanliness, or diseased conditions in general of the oral cavity.

But, if the predisposing causes of caries are considered with regard to imperfect structural development, and to a deficiency of the organic or inorganic constituents—then these again may be dependent upon the untoward effects of infantile disease, or other causes, prior to or after eruption which, interfering with proper nutrition, would render the teeth more liable to disease.

In the higher stages of civilization, the diseases of infancy and childhood are of more frequent manifestation than in semi-civilized or savage society; consequently normal nutrition is interfered with to a much greater extent in the former than in the latter case.

A deficiency in the blood of the mother, during gestation and lactation, of the elements necessary for building up these structures, might also, by preventing perfect development, predispose to caries in the teeth of the child.

Again, great deterioration in the dental structures of the mother, may and frequently does occur during these periods, as it is well known that the system may be and often is robbed of the nutritive elements—of the bone-forming materials which tend to the development of the embryotic system, to such an extent as to result in this retrograde metamorphosis, and the consequent loss of the teeth.

Nutrition being thus diverted, in a great measure, from the usual channels, the supply of osseous matter is not equal to the demand made by this extra drain upon the system, for the support of this complex being.

But the action of caries may also be modified as to severity, extent or degree, by the natural changes which the dental tissues undergo, either in the way of deterioration or otherwise, at times subsequent to eruption, for, as age advances, the teeth may improve in their composition, and thus their liability to caries be lessened; *au contraire*, by structural deterioration from any cause, their relative tendency to this affection may be increased.

May not a too rapid growth of the body cause a deficiency of ossific

matter in the teeth by a disturbance of the proper balance of organic and inorganic materials, and thus render them more susceptible to the action of external agents?

If, before full size is attained, the blood is deficient in quality or quantity—in certain constituents, in bone-forming material, for instance—the teeth will share in the general deficiency.

"The existence of certain materials in the blood," says Paget, "induces the formation of corresponding tissues;" and "the blood is definitely altered by the abstraction of every material necessary for the nutrition of a part."

At this period of excessive functional activity, the territory to be supplied may be increased in extent so rapidly that the blood shall fail to appropriate the nutritive material in sufficient quantity to supply the various tissues as fast as may be required for perfect development, thus inducing a lax state of the system and imperfect calcification of the hard tissues; for it is doubtless true that slow growth, if within the boundaries of healthy functional activity, favors the production of perfectly organized dental structures and induces normal development in other directions.

But when the maximum height is attained, in those cases where nutrition has failed to keep pace with excessive rapidity of growth, the tendency to dental caries will be lessened; for, though before this period, the osseous deposits were in limited supply, or were not assimilated fast enough to keep pace with development, the teeth will now become harder and denser, and the osseous system generally will attain to the solidity belonging to adult life; but in most cases the greater part of the injury has been done as the result of caries. These partially calcified teeth, which before were lacking in that density of structure which is so necessary to prevent the exciting causes from being manifested in their decalcification, will, by this limit to the increase of territory to be supplied, become less liable to the inroads of disease.

Any dentist of twenty years practical experience, must have noted during that time, the fearful deterioration in children's teeth, or, in the aggregate at least, a change greatly for the worse; so that now it is rare to find an individual, under ten years of age, with sound dental organs.

It is of almost daily occurrence to meet with children with nearly all of the deciduous teeth disintegrated by caries—mere wrecks—and that long before the time for shedding—with manifold abnormalities of the permanent set, as manifested in defective structural development and irregularity of position, accompanied by varying types of maxillary deformity.

Kingsley and others have attributed these effects to a want of harmony in the development of the physical and nervous system, or in other words,

to an unevenly balanced physical and nervous organization; to an undue state of activity of the brain and nervous system—the mental predominating over the physical--superinduced by the over-stimulation, or too rapid forcing of the intellect before the physical system has attained sufficient development to endure the strain or keep pace with the demands made upon it.

Imperfect development, or deterioration of tooth structure, may also be the result of a defective physical organization, whether the latter be transmitted or otherwise, or of constitutional disturbance from any cause, resulting in the impairment of vitality.

That hereditary transmission has much to do with the defective teeth of the present generation, is doubtless true, when we consider the habits of life which are accompaniments of the higher stages of civilization, and which have, with each succeeding generation, been growing more artificial; while the demands made by society have become so numerous, so imperative, and so tyrannical, as to induce an increase of nervous disturbance and loss of vital force, the consequence of mental anxiety and over-exertion, and of this strain upon the physical and nervous system.

Thus the penalty of this violation of nature's laws has become one of transmission, and is now felt by the generation which has just e' tered upon the stage of action. "The fathers have eaten sour grapes, and the children's teeth are set on edge"—(Jer. 31, 29; Ez. 18, 2,)—may have been intended to inculcate the principle, that the sins, indiscretions and follies of the parent, must inevitably be visited upon the children; and this truth is growing daily in force by the living illustrations which we meet on every hand.

Nervous disorders are becoming alarmingly frequent. Thus it would seem that nervous disturbance does indeed act an important part in the causation of dental disease, and that vital action has much to do with the maintenance of the integrity, or the improvement or deterioration of tooth structure.

There are other predisposing causes of dental disease to which reference may be made. For instance, there may be an excessive calcification or solidification of dental tissue, in which an excess of mineral deposits will work pernicious results. Teeth of this character, with the dentinal tubules closed, or nearly closed, by this deposition of calciferous matter, will subsequently fail to receive proper nourishment, owing to a lack of circulation in, or reception, or imbibition by the dentinal fibrils of the nutritive fluids, or, as some would say, permeation of the substance of the tooth, by these fluids. In these cases there is a deficiency of organic matter.

All teeth, in order to be healthy, firm and permanent, must not only assimilate a proper amount of nourishment from within through the pulp

tissue, and from without through the peridental membrane and peripheral portions of the cementum and dentine, but also from the alveolar periosteum, and contiguous soft tissues. If this circulation of nutritive fluids is cut off by this closure of the dentinal canals by limy deposits, the teeth become foreign bodies; for, where the conditions are favorable, even though the pulp has been devitalized, a sort of semi-vitality is maintained in the cementum through the root-membrane.

The class of teeth referred to in this connection, presents a white, chalky appearance, and are likely to be associated with puffy, inflamed gums, and crescent-shaped deposits of very hard tartar just under the margins of the latter, which destroys their connection with the teeth, and shuts off what nutritive material should be appropriated through this channel, or, in other words, the vascular supply of bone-pabulum.

These abnormally hard teeth, with their cervical deposits of dark-colored, hard, calcareous matter, would seem to indicate an excess of mineral elements in the blood and saliva. This character of tooth structure, upon which is dependent the loss of circulation and of vital connection, may also be followed by the absorption of the alveolar borders, and consequent loosening of the teeth.

Sometimes, in such cases, if local applications are made use of, as the elixir of vitriol and other caustic agents, and such are not carefully and sparingly employed, they will cause rapid and extensive destruction and recession of the gums, and alveolar processes overlying the roots.

There is another phenomenon to which attention may be briefly directed. Spontaneous or chemical abrasion of the teeth is ordinarily supposed to be the effect of acid secretions. In some cases there appears to be a complication of spontaneous and mechanical abrasion.

In one instance, which may serve as an illustration, the superior front teeth were worn away by occlusion to the extent of one-quarter or one-third the length of their crowns, while the right inferior molars presented very sensitive concave or saucer-shaped pits or depressions on the grinding surfaces, but otherwise, the antagonism of the anterior and posterior teeth was very close and perfect, presenting with the former, a well marked case of mechanical, and the latter, so far as the concave spots were concerned, spontaneous abrasion. This suggests the inquiry, which would seem to anticipate an affirmative reply—is it not possible for mechanical abrasion to take place without the contact of the opposing teeth with the abraded portions,—as in the case of the concavities above mentioned, giving it the appearance of having been produced by chemical agents, when, in reality, the effect was merely mechanical? Doubtless the two may exist together, but these concave spots may have been produced by the contact in mastication of food, seeds and other foreign substances with the dentine, after

the enamel had been worn away sufficiently to expose it—as these saucer-shaped pits were located where the enamel would most naturally have been first removed ; that is, in the region subjacent to the cusps.

If so, what would generally be considered a case of chemical or spontaneous abrasion, with reference to the back teeth, might be merely mechanical—the result of attrition.

Though the worn-down cutting edges of the incisors were sensitive, the concave spots were exquisitely so, until the sensitiveness was entirely and permanently removed by the application thereto, for a period not exceeding two minutes, of carvacrol in full strength.

The left inferior molars, having lost their antagonists, were not abraded, as might have been the case had the concavities been produced by chemical action.

The concave spots sometimes, though rarely observed on the cervico-buccal surfaces of the superior bicuspids and molars, and which present without discoloration of the dentine a very smooth surface, as if cut with a half-round file, would appear to be produced by chemical action, and may be found in the highest type and quality of teeth, and associated with healthy gums and cleanly mouths, and in cases in which caries has been but sparingly active.

But two well marked cases of abrasion of this peculiar character have come under my observation. What the exciting cause is, let others who may have more frequently met with such, determine.

Query : Was this removal of enamel and dentine, in the latter cases, the work of " resorptive cells," to which allusion has been made by Chase in the Mo. Dental Journal, Feb. 1875 ? And may not much of the so-called spontaneous abrasion be due to the same cause ?

What are the local and constitutional effects of certain medicinal preparations on the structure of the teeth, may form a subject worthy of special investigation, and is one to which attention should be directed, with a view to a more thorough understanding of what has assumed a greater degree of importance than has yet been recognized by dentists and physicians.

It is well known that medicines containing acids do have a deleterious effect upon the teeth by their local action upon the enamel and cementum. Their exhibition has become so frequent, and that, too, unaccompanied, in many or most instances, by a use of the means necessary to neutralize their action locally, that many teeth are greatly injured, if not ruined, by their administration. On this fact, so indisputable, as regards the action of acid preparations, it is unnecessary to dwell.

But that the excessive, long-continued, and in some instances, brief use of some alkaline preparations, noticeably the bromide of potassium, has a

deleterious effect on tooth structure, is very probable, whether combined with acid oral secretions or not, though not enough is yet known to warrant any positive assertions as to the effects of alkaline medication upon the teeth, either locally or constitutionally, inasmuch as when these or others are required, the systemic conditions are such as to unfavorably influence the nutrition of these organs.

The effects of disease in the impairment of vitality and the functions of nutrition are so inseparable from the use of medicines, that it is not always easy to determine, in such cases, whether the breaking down of tooth substance is due to chemical or vital action, though it may be simultaneously dependent on both.

Are not alkalies, in some instances at least, destructive to the dental tissues by their chemical action, whether by their employment medicinally or otherwise, they are brought in contact therewith ?

That the long-continued use, at intervals, of the chlorate of potash may prove destructive to the teeth, a case in point would seem to indicate. But before citing any examples, it may be well to remark, that isolated cases do not prove theories to be facts, though they may serve as sources from which gleams of light may be reflected. Dogmatic assertions should be avoided, unless sustained by positive proof. But certain pathological conditions may be held up to view, for the purpose of suggesting inquiry and eliciting truth as to the real or imaginary character of the causes which are seemingly associated therewith. Practically speaking, "straws show which way the wind blows."

A young patient, of good physical organization, active, strong and well nourished, had had prescribed by her physician a preparation of the chlorate of potash, for the relief of an affection of the throat, with which she was much troubled during the winter and spring months, up to her eighth year. The potash was always used whenever the trouble appeared. Her teeth were never stained by the greenish deposit so often found upon children's teeth, but were beautifully white, hard, and very dense in structure, presenting, for the deciduous set, a more than ordinarily well-developed denture. The lower molars, in which were most of the cavities, and which would have been the most likely to have been washed by the potash, soon commenced to decay in the proximal and grinding surfaces, though the incisors and caniines withstood to the last all chemical action. Fillings were inserted as became necessary, until the number was increased to eleven—three upper and eight lower—so that none of the teeth have been lost by caries, owing to this and the good quality of the tooth substance. In the first right inferior deciduous molar, which erupted in the fourteenth month, the first filling was introduced four months thereafter.

If the observations of Magitot, showing the relative frequency of caries in the different kinds of permanent teeth, it being in the proportion of three in the upper to two in the lower, hold good in regard to the milk teeth, it would show that the rule was reversed in this case, which adds strength to the theory, that the cavities were caused in this instance by the potash. Also, taking into consideration the well-developed and well-nourished physical organization of the child, the character of the teeth, the healthy condition of the gums and oral fluids, the case seems to present an example of the effects of an alkaline preparation in causing caries of the teeth.

Headland says, in regard to the chlorate of potash, (Action of Medicines, p. 317,) "At whatever part of the system it is introduced, it quickly makes its appearance in the secretions of the salivary and buccal glands, the quantity of which it slightly increases. It is to this fact," he says, "of its continued presence in the mouth, that we must refer, I think, the special action of this salt."

If this is true, the saliva would have been impregnated with the potash, and thus it would not only have been brought in contact with the teeth at the time of its administration, but subsequently thereto as well, by its reappearance in the fluids of the mouth.

The temporary teeth are less compact in structure than the permanent, the enamel layers are thinner, and according to some authorities, contain nearly 37 per cent. of organic matter. Of course the enamel plate is more easily broken down or perforated.

To the fact that alkalies act upon the teeth, by dissolving the cartilaginous and fatty constituents, is due the absence of sensitiveness, which is characteristic of caries produced directly by excessive alkalinity, as the sensitiveness resides in the vital portion.

In the case above referred to, there was very little sensitiveness attendant on the preparation of the cavities for filling; and in the case of a young man, in which the teeth were affected with caries of a very extensive and destructive character, and the fluids of the mouth were excessively alkaline, the cavities, though large, and situated, many of them, on the labial and lingual surfaces, as well as in every conceivable location, were unusually free from sensitiveness. As this case has been described by the writer, as to the character of the decay, the treatment, etc., only a few points will be presented in regard thereto, as tending, perhaps, to throw some light on the etiology of dental caries, in this and similar conditions.

Before the fillings were introduced in the front teeth, the gums which overlapped the ragged cemental borders of the cavities on the labial surfaces, were very much thickened and inflamed; and when litmus paper previously reddened by an acid, was held near and over them, vapor was evolved in abundance, and could be distinctly seen, and the paper immedi-

ately presented an alkaline reaction, indicating the presence of a volatile alkali, probably ammonia, thrown off by the decomposing organic tissues, the then diseased gums of the individual, which are now perfectly healthy, the sources of irritation (ragged borders) having been removed and other treatment instituted.

Now, if decomposing animal and vegetable matters, as inflamed, puffy and purulent gums, particles of animal and vegetable diet, etc., evolve ammonia when in the mouth, as fermenting and putrescent organic animal or vegetable matters do in other localities, why may not this agent (ammonia) when in excess, by acting upon the animal portions of the dentine, especially in teeth which contain an undue portion of organic tissue, produce caries therein of a more or less destructive type ?

The evidence of the presence of such an agent in this case, and the alkalinity in excess, of the oral secretions, appears to have been substantiated by proper tests; and as before stated, the almost entire absence of sensitiveness in the cavities would give force to the view; as one of the most efficient means of obtunding the sensitiveness of dentine is to keep the cavities free from acids for a time by temporary fillings.

In regard to the destruction of the teeth by alkalies, Prof. Summers, at a meeting of the American Dental Association, is reported to have said that acids act by combination, and alkalies by disintegration; meaning, probably, that in the former case, by the combination of acids with the inorganic portions of the teeth, decalcification is produced, and in the latter, by the dissolution of the organic matter in the dentinal tubes and ultimate loss of vitality, the breaking up or disintegration of the mineral substance of the tooth is effected; for it is well known that a tooth bereft of vitality becomes brittle, and disintegration sooner or later ensues. May not this be an explanation of the local action of alkalies upon the teeth, whether by excess in the fluids of the mouth, or by other means they are brought in contact therewith ? Or the action may be indirect, if by combination with oral secretions other destructive agents are formed.

The following may serve to illustrate the effects of alkaline medication upon the teeth, in connection with an anæmic condition of the system, perhaps dependent on nervous trouble, which might, of course, predispose the teeth to decay, by rendering the vital force resident therein less capable of resisting the action of external agents.

A lady was ill, and under medical treatment for a period of nine years; and though now considerably improved in health has not entirely recovered. This lady commenced to take homeopathic doses of the bromide of potassium seven years ago, when her teeth began to deteriorate. Six years

ago the administration of larger doses of the same was instituted three times daily, under allopathic treatment, which treatment was continued until about one and one-half years ago, when the bromide of sodium was substituted for the potassium.

Meanwhile the teeth continued to deteriorate, until they became mere wrecks. In the early part of her illness she also took muriate of ammonia. She could not take iron and has not taken any acid preparations. Her teeth show plainly the effects of this seven years' course of alkaline medication, though as before stated, nutrition must have been seriously interfered with by the malady; but as this would account only in part for the very extensive and almost total destruction of the teeth, it is evident that the bromides were the main cause of the loss of the dental organs.

As to the characteristic appearance of the remaining inferior teeth, (for the remnants of the upper denture had recently been extracted by a physician), all were much broken down in structure, excepting the incisors, the natural color of which, with the others, was indistinguishable, owing to a dark brown deposit with which they were thickly coated. The crowns of the lower molars were absent, some of the roots remaining. The inferior bicuspids presented sharp, ragged points or spurs of enamel and dentine on the grinding surfaces, with irregular patches of blackened and softened tissue about the cervical, facial and proximal surfaces, portions of the buccal and lingual walls only, in some instances, being left standing, with other and similar features, as to the appearance of the cavities.

Does the bromide of potassium act directly, by seizing upon the organic portions of the teeth, or indirectly, by forming, when brought in contact with acid oral secretions, hydrobromic acid, which, seizing upon the inorganic substance of the teeth, rapidly corrodes the enamel? May not the method, degree and directness or indirectness of action, as well as the character of the decomposed tissue, depend upon the acidity or alkalinity of the oral secretions with which the medicine combines, and the agent, if any, which is produced by such combination?

From the fact that the cavities in this instance presented this irregularly outlined appearance, the diseased dentine being soft and leathery, it would indicate the indirect action of the bromide of potassium by the production of an acid.

On the other hand, the fact that the decomposed dentine was nearly or quite black, would indicate the action of an alkali. Dr. Black, in a paper published by the Ill. State Dental Association, states that he has generally found black decay associated with alkaline saliva. Here the calcareous matter seemed to have been disintegrated, leaving behind organic tissue, though the patient would not permit more than a mere superficial examination, from which the character of the residue could be determined.

In another case, the administration of the bromide of potassium for a period of nine months, rendered the inferior teeth, especially, very chalky, whereas, just previous to the exhibition of the medicine they were well organized and highly polished structures, which might indicate the dissolution of the organic substance.

A personal use of the same medicine for a very short period, rendered the necks of the inferior teeth very sensitive; at least they were not so previously, and they are still exquisitely so. The sensitiveness would indicate the presence of an acid, produced by the combination of the medicine with the fluids of the mouth.

Besides ammonia, sulphureted hydrogen gas is frequently thrown off in the mouth, as a product of the decomposition of organic matter.

This gas yields, with metallic bases, besides water, sulphurets, many of which are insoluble and highly colored.

Dr. Black, whose experiments are cited by Dr. H. A. Smith, attributes the different colors observed in caries to the precipitation by the sulphureted hydrogen of certain metallic substances in the form of sulphurets, the color being influenced by the acidity or alkalinity of the oral fluids.

Thus iron, which is one of the constituents of the blood, would find its way into the dental tissues, and on the occurrence of decay might, by its precipitation by the sulphureted hydrogen, influence the color of the decayed portions.

To prove this, Dr. Black subjected teeth to the action of an acid solution, through which a stream of sulphreted hydrogen gas was passed, which gave a yellowish color to the solution, which was also imparted to the teeth. By neutralizing the acid solution with soda while the gas was passing through it, until it gave a decided alkaline reaction, the black color was observed, and by varying the intensity of the acidity or alkalinity, the various colors seen in caries were produced.

Reasoning from the results herein stated, the cause of the caries as well as the color, in the before-cited case of medication with the bromide of potassium, might be explained on this hypothesis: Assuming that the bromide of potassium was present as an alkali, as shown by the black color of the caries produced, the color being dependent on the action of the three agents, sulphureted hydrogen, bromide of potassium and iron, we may infer that an alkali was the exciting cause of the caries, for, according to the above theory, had an acid been present to have acted on the teeth, the caries would have been of the white or yellowish color.

It will be said that the bromide of potassium is a neutral salt, and so it should be; but on testing several specimens produced by prominent and

celebrated manufacturers, or at least taken from bottles labeled as theirs, the reverse was found to be true.

Slips of tumeric and litmus paper, the latter having been reddened by an acid, presented a decided alkaline reaction, in every case, on being applied to aqueous solutions of the bromide of potassium from a sample of each.

Therefore the exhibition of the bromide of potassium of commerce must be considered as alkaline medication.

The iodide of potassium, the bromide of ammonia, and similar preparations all act, probably, deleteriously on tooth structure, and in a manner similar to the bromide of potassium.

The iodide of potassium often contains the latter, and a tested specimen from a reliable house gave a strong alkaline reaction.

Concerning the various metallic substances which exist in the blood, and find their way into the system, which are present in the saliva and in the foreign matters in the oral cavity, which are inserted as fillings, etc., and which might influence the color of caries, it is unnecessary to enlarge. This seeming diversion from the subject was entered upon, as perhaps tending to show that the color of caries may sometimes indicate the cause, when the history of the case is known.

How the bromide of potassium and similar preparations act in the destruction of the dental tissues, is a question which invites investigation by the chemists of this and kindred organizations, and upon which the writer hazards an opinion only; and as it would more properly come within the scope of a report by the committee on dental chemistry, he here rests this portion of the subject, so far as the direct action of alkalies is concerned, in the causation of caries of the teeth.

Carbonic acid is also a product of the decomposition of organic matter.

Diseased gums and the debris of animal and vegetable matters, which latter finds lodgment in the mouth, and is allowed by uncleanly persons to continue in contact with the the teeth for indefinite periods, are continually evolving carbonic acid. It is also present in the mouth as a product of respiration and by evolution from the stomach, but whether it might be eliminated in sufficient quantity to prove destructive to the teeth, is a question.

The experiments of Magitot, Berzelius and Dumas, as cited by Wedl, of decalcifying teeth by subjecting them to the action of carbonic acid, as contained in Seltzer water, (one volume of water to five volumes of gas,) when the enamel became friable and the dentine softened, would suggest that this acid might be thrown off in sufficient quantity to prove destructive to the teeth.

The carbonate of lime, of which the enamel and dentine contain a small per centage, is soluble in carbonic acid, while the phosphate of lime is sparingly soluble. If it originated caries in certain cases, by seizing upon the carbonate of lime and disintegrating it, the other constituents would be rendered more susceptible to the action of chemical agents, by furnishing a larger surface to be acted upon by acids or alkalies, or by affording a foothold for fungi, and thus the progress of caries be accelerated.

If alkalies, in some cases, produce caries by chemical action, may they not also act indirectly, that is by the manifestation of constitutional or systemic effects, by which the teeth are rendered more susceptible to, or less capable of, resisting such action? We are told by Headland, that "alkalies dissolve fats and cause spareness of the system."

What then? Spareness of the system—anæmia—indicates defective nutrition. Defective nutrition causes deterioration of tooth substance, and at an earlier period imperfect structural development, by a withholding of the elements necessary for building up sound and healthy tissues, and by the impairment of vitality generally.

Headland also says—Action of Medicines, p. 188—"Saline medicines dissolve fibrin and waste the blood. Alkalies do the same." "By this dissolution of fibrine," he says, p. 202, "they (alkalies) appear to lessen its deposition and retard its formation," thus hindering nutrition and causing wasting of the tissues; p. 203, "alkalies pass out into the secretions as salts, having first combined with acid in the system, so that they must leave behind a certain excess of alkali in the blood, by which their action is continued for some time." Thus excessive alkalinity, by impoverishing the blood, causes the wasting and mal-nutrition of all the tissues.

Though in health the blood is said to be slightly alkaline, this alkalinity is increased in some diseases, as in fevers of a low type, as malarial, typhus and typhoid, in malignant scarlatina, etc., when the blood is supposed by some to contain an excess, and from this fact treatment by the administration of acids, mineral and vegetable, has been instituted with success, (Headland, pp. 136 and 138,) the effect being to neutralize the excess of alkali in the blood.

The question here arises, does this excessive alkalinity of the blood, which is supposed to be due to ammonia, act upon the dental tissues chemically as well as systemically?

Ammonia being volatile, is excreted on the mucous surfaces of the lungs, on the skin, and from the breath and saliva, and in febrile disorders is present in the blood in undue quantity; the oral cavity might, by this means, contain it in excess, and thus it might prove deleterious to the teeth by attacking the organic portions, in addition to the mal-nutrition of the system, which might more particularly predispose to such action.

Dr. Watt is reported as having said, (Dental Register, May, 1875, p. 214.) "When decomposition results in the presence of ammonia, caries is more likely to result than if the fluids of the mouth were slightly acid," and he explains this by saying, "Nitric acid results from ammonia, causing white decay."

Dr. B. Jones has also stated, (Headland, p. 389,) that ammonia in large doses undergoes oxidation in the system and produces some nitric acid. which statement Lehmann and Jaffe' call in question, the latter having arrived at a contrary conclusion, by a repetition of Dr. Jones' experiments.

But if the presence of ammonia in the system results in the production of nitric acid, why administer an acid to neutralize excessive alkalinity? If the alkalinity were due to ammonia, and the formation of nitric acid was the result, would the administration of acids be deemed necessary? By such chemical action the alkalinity could not continue to exist, and if the statement of Headland is true, (p. 392) that "the fact, if established, of the increased excretion of ammonia by the breath and skin, in low fevers and eruptive disorders, is by itself a contra-indication to the employment of the agent, because showing that there is already too much of this alkali in the system."

The development of oral organisms in connection with, or as accompaniments of dental caries, has led to a consideration of the question as to what part they play, or whether any, in the destruction of the dental tissues.

While some consider them to be the originators of the disease, the weight of evidence seems to indicate that they are merely outgrowths or consequences of it.

Prof. Pierce says, "It is a question worthy of consideration, whether the presence of these organisms might not rather pass for consequences of the disorder than causes."

Prof. McQuillen considers that the fact that these organisms can be found in great numbers in the mouths of persons whose teeth are perfectly sound, is fatal to the theory that they exert a destructive influence, though he seems to think that the protococcus dentalis, or green fungus, which is found so frequently on the teeth of children, is an exception.

Wedl, on the contrary, (Dental Pathology, p. 415,) considers that the protococcus dentalis (associated with a form of caries termed by Klenke vegetative decay of the teeth,) is only an accompaniment and not a cause of caries.

The leptothrix buccalis, so frequently a concomitant of dental caries, Leber and Rottenstein regard as a cause of caries, or at least that it is only necessary that a mere surface breach of the dentine, however small, be effected by acids or otherwise to permit of the penetration of and prolifera-

tion in the tubules by the fungus, and that in cases where the destruction of the teeth is at all extensive, a participation by the leptothrix is requisite, and that caries is thus developed much more rapidly than when acids alone are the destructive agents; and they assert that leptothrix cannot penetrate normally hard enamel, and probably not dentine, without such previous surface action by the acid, and that the latter is, in dry caries (so called) the sole active agent.

Wedl is of the opinion that the death of a considerable portion of the dentine by the action of an acid is necessary, to render it possible for the fungus to penetrate and expand the dentinal canals, which phenomenon he has never observed in the deeper layers of hard, carious dentine. Owing, also, to the fact that he has been unable to find any deposit of leptothrix on the exterior or interior of a tooth prior to the formation of a cavity, he considers that leptothrix have no direct connection with the origin of caries, though we are led to infer that after the death of the dentine by the action of acids, the leptothrix buccalis is the active agent of decomposition, or in accelerating the decay by the penetration and expansion of the dentinal canals.

In the lower incisors, where the acid is neutralized by the saliva, "caries," he says, "does not occur, notwithstanding the presence of thick layers of leptothrix, such as are met with in tartar."

But caries, not unfrequently, does occur here, though probably consequent on chemical action. This is the substance of opinion concerning the influence of oral organisms or fungi, in the production of caries.

To recapitulate: The origin of dental caries, so far as chemical action is concerned, is, in the opinion of most dental writers, dependent on the abnormal secretions of the gums and other portions of the mucous membrane of the oral cavity, and also of the salivary glands, as well as by the lodgment about and between the teeth of putrescing and fermenting animal and vegetable matters taken as food, any or all of which, by decomposition result in the production of acids, which extract the calcareous salts from the mineral portions of the teeth, thus decalcifying and disintegrating the affected territory; while few will deny, at the present day, that vital action is also influential in promoting or retarding the disease, many, if not most, hold with Prof. Garretson, that "Caries of the teeth is a chemico-vital action, and most markedly a trouble of hereditary transmission and predisposition." He regards it as "more of a vital or constitutional than a local or chemical trouble," and, as "most scientifically treated as caries of bone is treated," i. e., by local and constitutional treatment. "It is inflammation in the one case and inflammation in the other," modified by the differences of structure which exist between the two. If the bones were as much exposed to the direct action of external chemical agents as are the teeth,

they would be likely to suffer as frequently from the same causes, in a measure proportioned to the relative liability of the two to inflammatory action.

But the various theories advanced by dental writers as to the causes of caries are too well known to require even brief mention at this time.

But few, if any, writers of note seem to recognize that alkalies exert any direct action upon the teeth. That the action is limited, must be admitted, and that they act at all is not, perhaps, established by conclusive proof, though enough has been stated to indicate that they may, in certain cases, and in certain directions, exert a deleterious influence upon these structures, which influence is dependent in extent and degree, as is the action of acids, on the relative proportions of earthy and animal matters in the composition of these organs, which latter condition is also modified by the age, health, diet and hereditary influences affecting the osseous system of the individual, as well as the nourishment received by the embryotic system or tissues during this portion of the formative period.

The action of alkalies upon the system, as a predisposing cause of dental disease, has not, so far as a necessarily limited observation extends, received any attention, in order to determine if any such influence exists, though vitality must be affected in a greater or less degree by the acids and the alkalies with which the system may become charged, if in excess, and thus by its impairment or quickening, influence the character of all the tissues and organs of the body.

It is quite difficult to separate the chemical from the vital theory, and admit one to the exclusion of the other, when considered with regard to the part taken by these forces in the impairment or maintenance of health in the dental tissues; since the nutritive functions, if action is normal, will enable the teeth to withstand to a greater or less extent the effects of chemical agents, though by a cessation or impairment thereof, they are rendered incapable of such resistance from such a source, so far as any influence of this nature can be of service.

DISCUSSIONS.

DR. CLOWES: The wisdom tooth has had rather a bad name among the dental profession, and it has been popularly supposed to be the weakest tooth in the mouth. This is a very mistaken idea. It is, on the contrary, one of the strongest of all the molars. This will be evident to any one who will make an examination of the surface of these teeth. For instance, take the sixth-year molar. It has from three to five weak places in its enamel. The twelve-year molar has from two to three weak places, whereas it is a very rare thing to find more than one weak place in a wisdom tooth. It seems to me that that is pretty good evidence of natural strength.

DR. ABBOTT: Just one word in regard to the sixth-year molar. Dr. Clowes has said that that tooth is generally lost early. That is a very erroneous statement. In the hands of a skillful dentist, I see no reason for its early loss. There are a great many sixth-year molars that can be saved a long time, and there are a great many wisdom teeth that are good for nothing, even if saved, because they are nothing but little pegs. In a great many instances these teeth never come, and again, you see many people with only one molar on a side, and frequently there is only one cusp or point antagonizing against the opposite tooth, and that is the only masticating surface you have. The course of a wisdom tooth in coming, is almost always outside the arch in the upper jaw. In the lower jaw it may be in a line, it may be outside, and it may be inside. There is no regularity about it, and if you extract the sixth-year molar, and depend upon the wisdom tooth, the result will be that your twelfth-year molar will be tipped forward, so as almost to destroy the masticating surface. I shall raise my voice most emphatically in favor of making it a general rule to save the sixth-year molar. There are cases where it is necessary to extract it. I have had one within a month, where I found it necessary to remove all four of them, and yet they were all sound and healthy. The trouble in this case was that the teeth were so excessively large as to impair the expression of the face.

DR. HUNT: I am sorry we have not more time to discuss these im-

portant questions. Etiology is one of the most important branches of science to us, because if we can pursue it so far as to find the cause of decay of the teeth, and diseases of the oral cavity, we have made one great step toward ascertaining the remedies which will prevent that decay.

Our function as dentists is not so much to cure the existing disease, as to prevent a recurrence of that disease. If we wish to accomplish our mission, we must go back of the actual disease, ascertain the cause of the decay, and then apply the remedy calculated to prevent a recurrence of the trouble.

There is a movement on foot in our country, by which it is desired to unite the whole profession in this country and the whole world, in collecting statistics with reference to the condition of the human teeth in connection with food, habits of living, etc.

We know that the teeth of people in this country are deteriorating in every generation. Teeth in this generation are inferior to those of the preceding, in structure, durability and strength. In a paper read in Washington—a paper full of stubborn facts with reference to the crania of the races of this continent, it was stated that out of a collection of a thousand skulls of North American Indians, where every skull was minutely examined, there was found to be only two cases of caries—arches well developed, teeth magnificently structured, and perfect in their appearance. There was but one case of irregularity found in the whole collection.

DR. MCQUILLEN: In the admirable paper presented yesterday by Prof. Hawxhurst, he directed attention to the retrograde evolution of the jaws, indicating that there has been a contraction on the part of the jaw, commencing with the savage races. It is well, perhaps, for us to remember what is stated by Macauley—that when the legions of Julius Ceasar entered England, he found the inhabitants of Britain on a level with those which Capt. Cook discovered in the Sandwich Islands. Here we have evidence of the fact, however much we may controvert the views of Darwin, of our origin from a lower race of beings—that the highest of civilized people have sprung from savage life. In connection with this point, my friend referred to the skulls in the Academy of Natural Sciences, as bearing out the position which he there presented, as to the difference in the form of the skulls in savage and in civilized life. I have brought with me, in support of his views, a specimen belonging to me, being the skull of a negro of low type, and in presenting this skull I do not wish to be understood as asserting that there is no power of development on the part of the negro. I merely present this as an illustration of the development of the jaw in a low type of the negro, and you will observe the immense jaws, the wide-spread condition of the teeth, etc. Here, again, we have another skull of an Australian, where you have a wide expanse on the part of the jaw, and a

fine development of the teeth. Then, again, we have a Sandwich Islander. Here there is a nearer approximation to the jaw of civilized life, but at the same time you will observe that there is a broad expanse of jaw—no contraction, no irregularity, so far as the teeth are concerned. Here, again, I present to you the skull of an Indian from Florida, which exhibits the same general points. In the collection of skulls at the Academy of Natural Sciences, we have the civilized and the savage races represented—the civilized races of ancient times, of Greece, Rome and Egypt, in their palmiest days. We have also the savage races of ancient times, and the savage races of our own day. And in all this collection I do not recall a single instance of irregularity. Now, what is the reason of this? It obviously is because these races lived according to nature.

The food selected was not of that delicate and luxurious character in which civilized nations are in the habit of indulging. It was coarse food—simple and unseasoned. The food of such races has more resistance, and its mastication consequently has a tendency to develop the jaw. Not only is this true of the savage races, but it is true also of the English, German and Scottish people who emigrate to this country, who have been accustomed to live in a natural manner.

We hear much of the importance of our food containing the phosphates and carbonates of lime, in order to a proper nourishment of the teeth. Are we to forget that the teeth are not made up of phosphates and carbonates of lime? We want meats, as well as phosphates and carbonates of lime.

There is another point I wish to touch upon: In this skull (indicating) you will observe a loss of the teeth in the lower jaw on the left side. There has been absorption as a consequence, and you will observe that the molar stands out from the alveolus. Here we have an illustration of the harmony of antagonism. People are kept in their places by having antagonists, and so are teeth.

Dr. Atkinson: I am generally upon both sides of any question which is presented before this body. For there are a great many sides to every truth.

I wish to speak more particularly just now upon the subject of etiology in its bearings upon the deterioration of the teeth, and endeavor. in some measure, to account for the wide-spread deterioration in teeth of the present day. I announce it as my opinion that it is due to a difference in the mode of nourishment during the infancy of the children of the past few generations.

If you take the lines of country where disease is most prevalent in the organs of mastication, and those where it is least prevalent, you will find this difference: that in the first case this custom prevails—the mothers as a

rule nurse the child until it is able to begin to masticate food and appropriate the elements, and then, instead of allowing the child to chew the food, the mother reduces its food to a pulp in her own mouth and then puts the mass in the mouth of the child. This process has robbed the food of some of its most essential elements.

If we inquire into the primary cause of early decay of the teeth, we will find that it consists in improper nursing and nourishment during the period of infancy.

If the child, after being well begotten, gestated and born, is supplied with the nourishment which nature has provided, the dental organs will get a sound and healthy development.

REPORT OF THE COMMITTEE

ON

DENTAL LITERATURE.

BY M. S. DEAN, CHAIRMAN.

Having received no response from the other members of this committee, to the inquiry as to what branch of dental literature they would report upon, I am led to believe that whatever is written upon this subject must, unfortunately devolve upon myself.* I shall, therefore, treat the subject under the following heads:

I. JOURNALISTIC LITERATURE.

II. TRANSACTIONS OF SOCIETIES.

III. BOOKS.

The first branch of this subject was very ably and quite fully discussed in a report by one of the members of that committee at the meeting of this Association in Detroit; and, as much that it contained will apply with equal force to-day, and as it expresses, with some exceptions, which will be noticed hereafter, the views of your present committee, it will be unnecessary now to go over again the whole field embraced under that head.

The Journalistic Literature may be divided into two classes. First—Journals which are published and controlled by manufacturers and dealers in dental goods. Second—Those which are published independently of such establishments, and of dental institutions of any sort.

There are five of the former class published in the English language, all

*Since presenting this report, I have learned that Dr. E. S. Gaylord mailed a paper to me upon this subject, which has not been received.

of which are of American origin, viz: "Johnston's Miscellany," the "Cosmos," the "American Journal of Dental Science," the "Dental Register," and the "Missouri Dental Journal." Of the latter class there are three, viz: The "British Journal," and the "Monthly Review," published in England, and the "Pennsylvania Journal of Dental Science."

It will be seen from the above that of the six dental journals published in America, only one belongs to the latter class. Is this fact of any significance as to the tone or character of our periodical literature? Does it indicate that the standard of these journals has been lowered in the hands of such publishers, or that the cause of education and science has been retarded through the influence of the commercial interests with which these journals are connected?

After a candid and impartial consideration of this question, I conclude, and I think most of the profession will agree with me, that the connection of commerce with journalism has not thus far tended to produce these evil results.

Some of our members, however, whose opinions are worthy of great respect, and I may specially name the author of the admirable report referred to, entertain contrary views, which were decidedly expressed at the above-mentioned meeting.

But what disadvantage arises to the profession from the fact that these journals are published by men who are engaged in commercial pursuits? Their pages are as open to the profession for the discussion of all topics as if they were entirely independent of the houses that furnish the means of publication. This might be otherwise if there were but one or two dental journals published in America; but as we have six competing journals, no literary production of real worth pertaining to dentistry is rejected, even though it tend to disparage the commodities which are advertised within the same covers. No one could reasonably claim freer media of communication in any so-called independent journals than we now have in those which are published by commercial houses. The objection raised against this class of journals, in the above-named report, "that any dealer in dental goods publishing a magazine, is liable to lose a customer if he declines to publish an article sent him, no matter how crude, illy-constructed, or ungrammatical it may be," is certainly inconclusive. It seems to me that this argument would apply with equal, if not greater, force to journals that claim to be independent; since the publishers of these depend entirely upon subscriptions and advertisements, and would naturally be less inclined to risk the losing of this patronage by declining to publish whatever may be sent them.

In observing the management of these journals for several years past, your committee has been unable to find cause of complaint, in regard to this

particular feature of our journals, viz: their connection with commercial interests; but, on the other hand, we believe that at the present day, at least, they are more beneficial than if they were conducted upon the "independent" plan.

Let us suppose, for instance, all our dental journals to be independent of all business interests, etc.; they must be sustained, not alone by the subscribers, but by the "dealers in dental goods," and by the dental colleges; for there is no journal that does not receive a considerable share of its support from these latter sources; and without this aid, even if they survived at all, they could maintain only a feeble and sickly existence. Being thus dependent upon the advertisements of manufacturers and venders, and of dental colleges, by parity of reasoning they could ill afford to admit articles into their columns that would speak unfavorably of the conduct of any dental institution, or of the goods and appliances of any dealers advertising therein, lest these sources of revenue should be withdrawn.

Suppose we concede that journals connected with business interests "are apparently published with the design of causing their literature to carry the advertisements"; is it not clear that the better these publishers make this vehicle, the more extensive will be the circulation of their advertisements, and the more successfully will their object be accomplished? Hence, the shrewd business man, with abundant means at his command, would spare no pains or expense in making his journal such a vehicle.

Besides, it will be admitted that manufacturers and dealers in dental goods, men accustomed to the details of general business, and having commercial relations in various parts of the country, can publish and introduce a dental journal at much less expense than could be done by men of our profession, and hence they can afford us a better and larger journal at the same cost.

Now, what are the real facts concerning the quality of the journalistic literature published by men connected with commercial houses, as compared with that of journals called "independent"? Has there been, or is there now any dental journal, which is disconnected with such houses, that is more ably edited or better adapted to the wants of our profession? Are the selections made with better judgment, or is the original matter any nearer what such periodicals should contain? These questions can be best answered by taking the leading journals that are connected with manufacturing and commercial houses, and comparing them with the best that are published independently of such interests. The only journals that belong to the latter class and published in the English language are the "Pennsylvania Journal," the "Monthly Review," and the "British Journal." The "Pennsylvania Journal" is an American production, and we do not under-

estimate the energy and ability of its editor and publisher, nor detract from the value of this journal, when we say it certainly can not claim superiority over the "Dental Cosmos," nor indeed over any of the other five journals belonging to that class. The other two are published in London. While they are edited with unquestionable ability, yet they contain considerably less reading matter, and are not so well adapted to the wants, at least of the American dentist, as several of our own journals. Though they contain many articles of great scientific merit, to which we bow with profound respect, they at the same time contain others which are pretentious, and as authorities, are at least questionable. In pathology, therapeutics and operative dentistry, we consider our leading journals the more reliable. But in physiology, histology, and kindred sciences, we cheerfully yield the palm to our British brethren.

Both of the London journals contain abstracts of the proceedings of the Odontological Society of Great Britain; the British Journal contains, also, the reports of the Dental Student's Society, and of the Odonto-Chirurgical Society.

One of the commendable features of these journals is, that neither of them copies articles originally appearing in the other; and though they borrow quite freely from the medical literature of Great Britain, and the medical and dental literature of Germany and France, and to some extent of America, the same literary or scientific matter, with the exception above named, is rarely found in both.

On the contrary, in America, we sometimes find several journals containing the same article, even among their "original communications." This is, perhaps, more the fault of the editors than of the authors, since it should be stated specifically in the journals on what conditions the articles will be accepted, so that writers can understand clearly the ethics of contributors. Only such articles as contain new and important scientific or practical facts should be copied from journals that are accessible to the profession. In this respect our journals might imitate the practice of our English neighbors with satisfaction to the reader.

There are evils in all our periodical literature, for which your committee are at a loss to point out a practical remedy. I allude to the errors which are often found in articles of some considerable value, and which may confuse or mislead the young practitioner; communications which are, in some respects, too valuable to be rejected, but which, in some of their teachings, conflict with known scientific principles.

The question is: Should these errors be pointed out by the editor in the same number in which such article appears, or should they be left for the future criticism of some writer who may discover and correct them; or should the article be rejected?

Your committee is of the opinion that either the first or the last plan should be pursued. And yet the first course, though preferable, would be requiring more of the editorial department than is generally the case in medical journals.

While all our dental journals contain from time to time articles of great value, both of a scientific and practical character, we find in them, also, articles abounding in visionary hypotheses, supported merely by surmises which are gravely stated as facts; yet, as a whole, our journals are conducted with increasing vigor and ability, and are, perhaps doing fully their share in advancing the interests of our profession. Happily the practice of dentistry is for the most part founded upon demonstrable science, and is not seriously effected by wild speculations, which indeed may sometimes contain in a crude shape some advanced idea which other minds may sieze upon and make useful to the profession.

Your committee would urge upon the members the importance of liberally supporting our journals; for, without them no practitioner can keep pace with the progress of dental science and art. And to those who have not already done so, we would say: add to the number of your periodicals either the "British Journal" or the "Monthly Review, for these, though they can not supply the place of your own journals, will be found of great value, and may fill a want not supplied by our own.

While many of our members subscribe to all, or nearly all, of our journals, none should take less than three or four of these, besides one at least from abroad. You will find in all these considerable matter which, to most of you, will be worthless, but which to others may be useful or interesting. But fortunate will be the practitioner whose scientific education and logical habits of mind will enable him to detect the errors and fallacies which some of this literature contains; and thrice fortunate he who avails himself of the valuable truths in which they abound, to enrich and perfect his knowledge of the profession of his choice.

II. LITERATURE OF TRANSACTIONS OF SOCIETIES.

Some of the best dental literature of our country may be found in the transactions of our associations; and perhaps I might add with equal truth, some of the worst also.

Seven of the state societies—Illinois, Pennsylvania, California, Iowa, Wisconsin, New York and Ohio—have inaugurated a system of publishing separately their annual proceedings.

The Illinois State Dental Society was the first to adopt this plan, and has already issued eight consecutive annual volumes.

The Pennsylvania Dental Association comes next in order, both as to

time and the number of volumes issued; and the Dental Society of the State of New York has recently published its second volume of transactions, which contains the proceedings of the sessions of 1873 and 1874, the first having contained the transactions of the two preceding years.

A portion of these printed transactions, and of the proceedings of other societies, have found their way into our monthly journals. Indeed, the essays and reports of the discussions of dental societies constitute a considerable share of our journalistic literature.

While some of the essays in the transactions published by these societies are exceedingly faulty, both as literary and scientific productions, and nearly or quite valueless in their practical teachings, the most of them possess some merit, and a few are excellent. But notwithstanding these imperfections, and the still grosser blemishes which often appear in the reports of discussions, these transactions are evidently deemed of sufficient interest and importance to the societies themselves to warrant their publication.

Some of the members, however, would prefer the omission of such matter as is not of sufficient merit to reflect credit upon their society; and doubtless nearly all have felt somewhat humiliated by some of the literature of our transactions, and would be glad to see our societies less ostentatiously display their ignorance upon many subjects.

In the April number of the Dental Cosmos the editor doubtless expresses the sentiment of the great majority, when, in speaking of these transactions, he says: "It is high time that the associations should bend their energies to the weeding process, regardless of the men or the positions they may occupy."

This matter, I am aware, has often been discussed by publication committees, and they have been unable to see clearly that this "weeding process," applied to the transactions of state societies, would at the present time at least result in the good of the societies from which they emanate, or of the profession at large. If this course was rigidly carried out by these societies, their annual volumes would shrink to very small proportions, and would soon cease to appear at all.

It would seem then that the only question to be determined is, whether these transactions, with the gradual improvement that will naturally follow in time, are of any value to the societies themselves.

Those who have observed closely the practical effects of these publications, feel convinced that they tend to stimulate individual effort among the members, who, having a personal and proprietary relation to them, peruse them with great interest, and thus is created a desire for more extended information upon the subjects therein treated, and they are led to seek for it in our periodicals and standard works.

If this be true, these publications have both a direct and indirect tendency to educate the societies from which they proceed. And if such transactions contain any articles of sufficient merit, they may be gathered into the periodical literature and made the property of the whole profession.

Besides, these full records may at least aid the future historian in determining the actual status of our profession at the times they were issued, and enable him to trace with certainty its advancement.

In addition to the transactions of these seven state societies, we have those of the American Dental Association, the Southern Dental Association, the American Convention, and the Odontological Society of New York, all of which possess more or less of a national character.

The latter society has issued two volumes of its transactions, which have appeared during the last two years. These proceedings bear witness to the energy and ability of this young association, and its reports take the foremost rank in the literature of transactions of societies.

By its constitution, the number of active members is limited to twenty. These are men of marked ability and residents of the city of New York, while the associate members embrace a large number of the leading men in the profession throughout the country, which gives to it its national character.

If the promises which were given in its two volumes of transactions are realized, it will, in the not far distant future, gain the same standing and influence in America that its namesake has acquired in Great Britain.

The transactions of the American Dental Convention have not been issued annually, only one or two volumes having marked its career. A portion of its annual proceedings, however, have been published in the monthly journals. Owing, perhaps, to the exceedingly liberal character of this organization, no qualifications for membership being required, the transactions of this body have not gained a very high rank in dental literature. While its meetings have been attended by many of the ablest men of the profession, few of them have given their best productions to its literary fund.

SOUTHERN DENTAL ASSOCIATION.

This association was organized in the year 1869. As announced in its constitution, "The object of this association shall be to promote professional and friendly intercourse; to develop dental literature, and encourage a high standard of dental education." Its membership, according to its constitution, consists only of dental practitioners who have received degrees in dentistry or medicine. From which it will be seen that this association requires higher professional qualifications for membership than any other in this country.

Whether this latter fact has proved advantageous to its literature, and whether the dentists, spread over the large extent of territory naturally embraced by this association, have been as much benefitted by this high standard required for membership as may have been anticipated by its originators, admits of considerable doubt.

The transactions of this society, if your committee is capable of judging correctly, do not occupy the highest place in this branch of literature, and hardly satisfy the high expectations that the friends of this association hoped to realize. Although committees of able men have been annually appointed to report upon the following subjects, viz: Dental Education, Physiology and Surgery, Histology and Microscopy, Dental Chemistry, Dental Therapeutics, Operative Dentistry, Mechanical Dentistry, Dental Literature, and Dental Pathology, very few of these committees have presented reports to the association.

This defect is partially, and only partially, made up by the voluntary essays, which possess about the average merit of those found in the transactions of our state societies.

To ascertain the cause of this, and to find a remedy, are important problems, not only to the association itself, but to the whole dental profession, who look to these transactions for their best literary efforts. These problems your committee will not attempt to solve, but in reviewing the transactions which have been issued from year to year, we have noticed that the members seem to lack interest in their association, very few of those who take part in one of its sessions being present at its subsequent meetings.

May not this to some extent be owing to the high qualifications required for membership, which must necessarily prevent the attendance of a large number of dentists, and thus make these gatherings comparatively small, and in consequence less enthusiastic?

The plan of admitting delegates without granting them the full rights of membership, seems not to have been effectual in preventing the above result. There may be other and various causes for the seeming apathy of the members, and defects in the literature of this body; but whatever they may be, one thing is certain, that these evils are not irremediable, for, it only requires an awakening of the energy and enthusiasm of its members, so eminently capable of remedying these defects, to place its literature in the proud position where it rightly belongs.

THE AMERICAN DENTAL ASSOCIATION.

In concluding this branch of our report we would briefly refer to the Transactions of the American Dental Association, and this we do with diffidence, and with considerable doubt as to how this literature should be treated.

It may be proper at the outset to premise that this association is composed of delegates and permanent members. Each local society throughout the country is entitled to send one-fifth of its members as delegates. Each of these delegates may, if he choose, become a permanent member. Now it is a well known fact that these local societies do not in all cases select from their numbers those of the most distinguished ability to represent them; for, being entitled to send more delegates than can attend this association, they confer certificates upon any of their members who may desire, or will accept them, without regard to their qualifications or fitness as representatives. For this reason, this association is made up of all classes and grades of the profession, and in consequence its literature takes a wide range, and represents hardly more than the average literary talent of the profession in America.

While your committee would not criticise the organic plan upon which this association is based, it is confident that the mediocral grade of its literature is owing in some degree to the carelessness or good nature of the executive committee, upon which devolves the duty of selecting the Standing Committees.

While the difficulties this committee has to encounter are fully appreciated—frequently finding the best qualified for these positions least willing to accept them—yet the fact remains patent that many of our most capable and representative members, for some reason, are not found on the list of "Standing Committees." For the reputation of this association and the credit of its literature, it is hoped that this fault may be, in a measure at least, remedied in the future. Indeed, that there will be a gradual but marked improvement in its future literature, must be an inevitable result; for the ranks of this association are now being filled up with young men, possessing high educational and scientific attainments, and who will infuse into its literature a more uniformly permanent value.

This association would secure a higher degree of respect, should the publication committee exercise a stricter supervision over its reports and discussions, and perhaps its usefulness, also, would be much increased thereby. It has matured and strengthened to such a degree that the tares may be rooted out without endangering the wheat, and perhaps with positive advantage to its growth.

And yet your committee would not recommend a very rigid course to be pursued in the culling and pruning of the reports of its proceedings for the printed transactions, lest this process, if too thoroughly carried out, should destroy that natural freshness and freedom which are the soul and life of all such associations.

In this matter the recent action of the "Odontological Society of Great Britain" may afford us a profitable lesson.

Until within a few years past, the transactions of that society contained only the choicest papers read before it. They now contain, besides these, the full report of the discussions of each meeting. Although their transactions are now perhaps less purely scientific, as a whole, yet the new arrangement, it is said, has achieved the desired object of increasing the interest of all the members of the society, and uniting them in closer bonds of friendship.

III. BOOKS.

No dental class books or works on dentistry have been published by American authors since the last report upon this subject. Indeed no work, except "The Student's Guide to Dental Anatomy and Surgery," by Henry Sewill, published by J. & A. Churchill, London, and Lindsay & Blackiston, Philadelphia, so far as your committee are aware, has been issued during the past year in any country.

"The Student's Guide" is a neat duodecimo of two hundred pages, and is deemed worthy of special notice in this report. Although, as its modest title would indicate, it seems to have been chiefly designed "to facilitate the labors of the student," yet, in the opinion of your committee, it contains too much valuable information to allow it to be monopolized entirely by the class of readers for which it was mainly intended.

On a somewhat careful perusal of this work we are quite favorably impressed with its general merits, and believe the number of dentists is small that will not be profited by its perusal.

This work is written under the following headings: "Anatomy and Histology of the Teeth," "Development of the Teeth," "Malformation and Irregularities of the Teeth," "Caries," "Treatment of Caries," "Exposure of and Diseases of the Pulp," "Dental Periostitis," and "Alveolar Abscess," and ten others, which it is not necessary to name here.

While the writer claims little originality for this work, he has evidently searched the best and most recent authorities upon the various topics treated, and has so arranged his matter that facts follow facts in such direct and natural sequence, encumbered by so few divergent theories, that the reader can find no difficulty in clearly understanding and retaining his meaning. In fact we seldom find a work of this kind less faulty in its literary style.

The treatment of all these subjects in a 12-mo volume of two hundred pages must necessitate great brevity, but the author performs much more than he claims for this work in the preface, where he says, the work is designed "to lead the reader to desire and direct him in seeking the fuller knowledge afforded by more extended treatises."

His article on the "Development of the Teeth," though brief, is well illustrated, and is a summary of the work of Messrs. Legros and Magitot, the latest monograph issued upon that subject by those physiologists. In fact he has drawn from all the sources at his command the latest and most reliable information that could be gained upon these subjects. And yet this little work is not entirely free from defects. For instance, under the head of "Treatment of Irregularities," he says, "When the direction of the canine is correct, it will in time take its proper place if room be afforded, but should it appear in an oblique direction, and its roots lying at an angle across the alveolar border, as in the case depicted in figure 27, it is unlikely that it could be brought into the desired position, even were mechanical treatment employed. In such cases the extraction of the misplaced tooth is the sole resource."

From the author's description of this case, and from the diagram illustrating it, this irregularity is by no means a very unusual or difficult one to remedy, and even if it were considerably worse than depicted, the practitioner who would extract such a tooth, would be justly deemed guilty of gross malpractice.

Happily this is the greatest error observed in the book, and one that would not be likely to mislead the practitioner, though it might the inexperienced student.

Under the same heading the following singular passage is found, viz.: "That the movement of teeth under the influence of pressure must be accompanied, in *some instances*, by absorption of bone, is beyond doubt, but from the fact that the opportunity for post mortem examination never presents itself during the treatment of these cases, the exact mode in which the changes in the tissues are affected cannot be ascertained, and *for a similar reason it is impossible* to explain the well known circumstance that, even after the absorption of bone *has been apparently* induced, and the teeth have taken the desired positions, they tend invariably to fall back into their former situation, unless mechanically fixed by the teeth of the opposing jaw, or retained for a considerable time by an instrument constructed for the purpose." (The italics are my own).

If your committee understands the meaning of the above passage, the author of this little work finds it "impossible to explain" some physiological facts which we had supposed were simple, and generally understood by the profession.

The treatment of the subject under the head of "caries" is excellent and quite thorough.

"The treatment of caries," though in some minor details differing from the views generally entertained in this country, is in many respects admirable.

In his preventive treatment he however recommends tooth powders composed of *strongly alkaline* bland and soluble substances, having no more mechanical power than enables them to remove the well known soft fur which coats the surface of the teeth in most mouths."

Your committee had supposed that precipitated chalk was equally efficacious as ant-acid, and that it was less liable than strongly alkaline powder to affect injuriously the structure of the teeth.

The author however afterwards says that "the desired objects are as well fulfilled by a mixture of precipitate of chalk and soap."

The portion of this chapter which treats of filling teeth is, in some respects, the best your committee has seen in any treatise upon that subject, and the illustrations are new and, in our view, in many points, superior to anything heretofore published.

The article on "the exposure of the pulp," and "diseases of the pulp," is good, though in the conservative treatment of the exposed pulp our own practice would differ somewhat from the views therein expressed. It must be confessed however that there is a variety of opinions on this subject among our ablest practitioners.

The author favors the filling of root canals with oxychlo-zinc, in preference to gold, believing it less liable to produce periostitis. This is a matter of opinion upon which the profession may be found divided.

There is a sentence under the head of "Diseased Pulps," which strikes your committee as being remarkable. It is this: "In cases in which there has occurred an outgrowth of new tissue sufficient to constitute a polypus, the extraction of the teeth is the sole treatment that can be recommended." This needs no comment.

The treatment of alveolar abscess is, in some respects, incomplete and unsatisfactory.

We need not occupy your time further in noting the imperfections, or what your committee believe to be imperfections, in this work, which are really not numerous. It is an easy task to find flaws in nearly all works of this nature. Notwithstanding the few blemishes that mar the perfection of this production, it is on the whole a work of genuine value, both for the dental student and the average practitioner.

"AN ANATOMICAL DESCRIPTION OF THE PERMANENT TEETH."

Your committee is in receipt of the advance sheets of a little monograph with the above title, by H. Judd, M. D., D. D. S.

A few words from its preface will give the association a better idea of the object of this work, than can be done by your committee in a hasty review of its contents.

In this the author says: "In all the anatomical descriptions of the teeth found in the text books, many of the most important points, such as a description of the fissures, sulci, fossæ, ridges, pulp cavities, etc., have been almost entirely ignored. A description of these being entirely new, in many respects, necessitates new names for the parts which have not been named before, and in this little work many new names have been added; but we have been careful to follow accepted nomenclatures when that was possible, and to follow analogies furnished by them to guide us in the selections of words altogether new.

"We have followed John Tomes in naming the surfaces of the teeth, as we consider his method the most concise and convenient of any yet used, and more generally adopted by the profession than any other; and we have followed Gray's Anatomy in giving distinctive signification to the terms 'root' and 'fang,' which," he continues, "accords * * with the evident tendency of the language for some time past."

That one branch of our literature has suffered for the want of a settled and distinctive nomenclature that will define with accuracy every portion of the teeth, there can not be the least doubt. In supplying this deficiency, the author of the treatise under consideration has encountered many and serious difficulties.

To describe each portion of these organs, which have neither symmetrical nor geometrical proportions, in clear and concise terms, which will readily and certainly convey to the mind of the reader and hearer the precise spot or point referred to by the writer or speaker, requires much patient labor and philosophical study of the languages.

That the author has faithfully and ably accomplished this work, the name it bears, and the action of the St. Louis Dental society, by which it is published and illustrated, would seem to be a sufficient guarantee.

Such a treatise, fully and systematically describing the teeth, will be particularly valuable to our literature on the branch of operative dentistry.

How often, while listening to discussions in our Dental Associations, have we been surprised by apparent diversities of opinion, which really arose from a want of proper and definite terms to describe clearly the different portions of the teeth.

It must be a remarkable work, indeed a superhuman production, that will entirely accord with the judgment and taste of every individual, where such an infinite mental diversity exists; and all the descriptive terms used by the author of this treatise may not meet the unqualified sanction of the whole profession. Yet we have observed but perhaps one of these, which seems to us particularly objectionable, and that is the use of the term "fang," to designate the branches or divisions of roots. For example, he

says, "The root of a superior molar is divided into three fangs, two labial and one lingual." "The root of a lower molar is divided into two fangs, a mesial and distal."

The etymological grounds upon which he bases this use of the word are apparent, but to our minds they do not fully justify such use; but if this term is to be retained at all, it is far better to use it in this distinctive sense, than as a synonym of root.

To the teeth anterior to the bicuspids, he never applies the word fang, but invariably calls them roots.

Gray, whom the author follows in naming these parts of the posterior teeth, seems to have made the distinction not intentionally but by accident. For, in describing the different portions of the incisors, he speaks of the "crown," "neck" and "fang," while he describes the canines as having a "crown," "neck" and "root."

This distinction in terms seems to have been premeditated, since in the one case the word "root," and in the other "fang," is the only subject of a paragraph, and is emphasized by the use of italics.

Why incisors should have fangs while the canines have roots, Gray fails to explain, and it is too deep a philological question for your committee to solve.

If they are not convertible terms, one or the other must have been improperly used, and if they may be used interchangeably, he might with equal propriety have said in his description of the molar teeth, "The fang is subdivided into from two to five roots," as to have said, "The root is subdivided into from two to five fangs."

So much for the medical authority which has accidentally given to the author of this treatise only a clew to a system which he has perfected and adopted, in giving a distinctive signification to the terms "root" and "fang."

Whatever may be said concerning the propriety of this latter term, as used by the writer of this treatise, all must concede that he has used it definitely and methodically, and in a more rational sense than has heretofore been given to it.

If this work shall be found defective in a few minor points, still your committee is fully satisfied that the author has done what no one has ever done before, in giving us a clear and concise anatomical description of the permanent teeth, which will be readily comprehended by the average intelligence of dental students.

TOMES.

Since writing the above, and only the day previous to leaving home,

your committee has received some advance sheets of a work on "Dental Anatomy and Physiology (Human and Comparative)," by C. S. Tomes.

The preface I have not seen. It will be a crown octavo volume of considerable size, judging from the sheets in our hands, which run from the 99th to the 146th page, and contain chapter IV.

This chapter is devoted to the development of the teeth of Fishes, Reptiles and Mammalia. In this the author shows the essential characteristics that are common to the different groups of vertebrates.

He says that "prior to any calcification, there is always a special disposition of the soft tissues at the spot where a tooth is destined to be formed." * * "All or a part only of the soft structures making up a tooth germ become converted into the dental tissue by a deposition of salts of lime." * * "The tooth is not secreted nor excreted by the tooth germ, but an actual metamorphosis of the latter takes place, * * at least of some portions of the tooth germ." * * "The three principal tissues, namely, dentine, enamel and cementum are formed from three distinct parts of the tooth germ."

"The 'follicular,' 'papillary' and 'eruptive" stages" into which the process of tooth development has been heretofore divided by anatomists, "are based upon a false conception—upon theories now known to be incorrect."

The author bases his account of the development of the teeth of man and mammals upon the researches of Kolliker, Thiersch and Waldeyer; that of reptiles and fishes to some extent upon those of Huxley and Santi Sirena, but principally upon Hertwig's and his own.

These conflict with the theories published by Professor Owen.

"Tooth germs," the author says, "are never found upon the surface, but are always situated a little, and sometimes a considerable distance beneath it." "Every known tooth germ consists in the first instance of two portions, and two only—the enamel germ and the dentine germ—and these are derived from distinct sources. * * "

After elaborating these points he takes up the development of the teeth of the Elasmobranch fishes, followed by the Teleostei or Osseous fishes, then the Reptiles, then Mammalia, describing each with minuteness and clearness, and illustrating the same by numerous and finely executed engravings.

This view of the comparative development of the teeth is not only interesting and instructive of itself, but gives the reader a far clearer and deeper insight into the processes of development of the human teeth.

The above is a very defective and crude summary of a portion of one of

the chapters of this work, but it is to be hoped that it may give the association some insight into the character of this forthcoming volume.

To dwell upon the literary merit of this work, or upon its highly scientific character is needless; in this respect the reputation of this young author is already too well and favorably known to this body to require commendation from your committee.

We would simply say in closing this part of this report, judging from the single chapter before us, this work excels both in its literary and scientific character, and in the magnitude of the researches of its author, anything that has previously emanated from his pen.

Your committee would therefore congratulate this association, and the whole dental profession, upon the speedy advent of this volume, which will not only prove a great accession to dental literature, but will supply a want which has heretofore been felt by all of us.

This work is to be reprinted by Lindsay & Blackiston.

HISTORY OF DENTISTRY.

Since the commencement of this session, there has been handed us a work entitled, "A History of Dental and Oral Science," prepared under the direction of "The American Academy of Dental Science," and published by S. S. White.

(We would remark incidentally that this is the only work which has been furnished your committee by either the authors or publishers).

This is a neatly gotten up royal octavo volume of 270 pages. From a hasty glance at this work it seems to be a valuable one, especially as a book of historical reference.

In its preface we find the following: "The effort has been to make the work strictly historical, and in no sense didactic. * * That most of its contents will be thought worthy of a place in history, and that it will prove of interest to the present generation, in enlightening them as to the work of their predecessors, and that it will be of value to the historian and essayist in directing him to sources of information, and as a preservative of the fast vanishing facts of the earlier days of American Dentistry, is fully believed."

While your committee believes the above to be strictly true, it also believes, from a cursory examination of its contents, that it is in many respects incomplete; but nevertheless, we believe the compiler has produced a commendable work, and one that will give the profession much information never before brought within their easy reach, concerning the rise and progress of our specialty, and which has been collected by "The American Academy of Dental Science," at great expense, and doubtless with equally great labor and care.

VOLUNTEER PAPER

ON

DENTAL LITERATURE.

By W. H. DWINELLE.

Most if not all of the real progress in our profession within the last hundred years may be practically embraced in the past fifty, nor till within the last twenty-five could it claim to be recognized as an established science, taking its place among the standard institutions of the world. To-day it is pre-eminently so.

Our profession, having for its aim the restoration, preservation and establishment of man, recognizing his immortal as well as his temporal nature —already "but a little lower than the angels; realizing that a sound mind could not exist within a diseased body, and seeing through the teachings of science that he is a microcosm of all the elements and principles of nature, it will be readily conceded that to preserve the whole in one, all that there is in art or science, and everything that can be conceived of by the human mind, may be made practically tributary to him to that end. The whole science of medicine and surgery as then understood, and all other known agencies, were brought into requisition to stay the tide that we found charging against us; even then we found ourselves but poorly prepared for the contest, and hence we early realized the necessity of creating and maintaining a new science, that should be continually expanding in its character, to meet the great exigencies before us.

A noble army were our predecessors, who responded to the call, and laid the foundation for the redemption of our people. The scientist, the physician, the educator and those of other professions, abandoned their own

callings to join and co-operate with us in our larger field, larger promise and larger philanthrophy.

The work of building up the superstructure began; it must be established upon the basis of true science; all art must contribute to it; it must be endowed with a true educational system; it must have its journal as an organ, and its literature, before it can take its place among the recognized institutions of the land.

How far we have succeeded, our annals and our achievements will show.

The necessity of systematic education being conceded as one of the first essential steps to our progress, measures were taken for the establishment of a Dental College, that should not only be educational but representative in its character.

Permit me here at this time to give an interesting account of the origin of the first, the initiative dental college of the world. It is embodied in a letter to me from Dr. H. Willis Baxley, one of the original corporators, and a member of the first faculty of the institution referred to above.

"LONDON, Sept. 29, 1874.

"*Wm. H. Dwinelle, M. D.*

"DEAR SIR—You ask me to write what I said to you some time since, about the where, when and how, and on whose motion, systematic instruction in dental surgery originated.

"Pressing engagements at this moment allow me to say but briefly, that in the summer of 1839, in the city of Baltimore, when I was engaged in the practice of medicine and surgery and in teaching anatomy, Dr. Chapin A. Harris, a practicing dentist in the same city, called on me and asked my co-operation in an attempt he proposed to make, to lift dentistry from its condition of a merely mechanical pursuit, of destructive rather than preservative tendencies, and give to it higher claims to rank as a legitimate branch of conservative surgery.

"Some years before that time Dr. H. H. Hayden, also of Baltimore, had delivered to a few medical students of the University of Maryland, some lectures on dental physiology and pathology. I was one of his class, and found the lectures very speculative and unsatisfactory. Certain it is that those engaged in tooth pulling, filing and filling, which then seemed the sole business of the craft, took no interest in Dr. Hayden's attempt to enlighten them. Nevertheless he is entitled to credit for an effort, however unsuccessful, to give dentistry better claims to public confidence.

"Dr. Harris' scheme was altogether more comprehensive, better fitted to draw to it the attention of those engaged in the practice of dentistry, and had a great advantage in being proposed and pushed by a man of deep con-

victions of duty, and of extraordinary enterprise, industry and self-sacrificing character. It contemplated the obtaining a legislative grant or charter to teach and confer the degree of Doctor of Dental Surgery. At the session of 1839–'40 of the Legislature of the State of Maryland, that enlightened body through the personal solicitation of Dr. Harris and myself, passed an act of incorporation of the Baltimore College of Dental Surgery, with the faculty herein named, viz.: H. H. Hayden, M. D., Prof. of Physiology and Pathology; H. W. Baxley, M. D., Prof. of Anatomy; C. A. Harris, M. D., Prof. of the Theory and Practice of Dentistry, and Thos. E. Bond, M. D., Prof. of Therapeutics, It is a pleasing record for the medical profession to look back upon, and see that all engaged in this movement were graduates of medicine, and had drank of the streams of progressive science from her fountains. The practical inauguration of the new college presented a difficulty well known in America, where professors often outnumbered students. At length five legitimate students of dentistry were found to covet the honor of the new title, D. D. S., and the first course of instruction was given in the winter of 1840–'41. The didactic lectures were delivered in a small room, publicly situated. But the teaching of practical anatomy demanded privacy, and other prudential considerations also suggested the use for that purpose of a secluded stable loft.

"It was not the first time the modest place of a manger became the scene of an event leading to infinite results. And, looking to the vast achievements in dental science following the stable loft beginning, the statement of the fact may encourage others in their day of small things hereafter.

"Participating in the early efforts under difficulties, giving practical shape to Dr. Harris' suggestions. I have been astonished at the marvelous results which in one-third of a century have flowed from them. An invalid tourist in foreign lands whither I have gone, I have found American dental anatomy, physiology and pathology, therapeutics, operative and mechanical appliances, supplanting the ignorant notions and destructiveness of olden usages, which have long clung even to European civilization.

"And American dentists themselves are welcomed and cherished as the originators and bearers of coveted blessings. By their influence dental associations, institutions and investigations have had birth abroad, and ere long, especially in Great Britain, Americans may expect to find rivals enter the lists with them in all that relates to this department of knowledge. Let me add my opinion, that unless American dentists check the tendency to deterioration now apparent in collegiate education, and raise the standard of preparatory and final qualification, as tested by thorough and impartial examinations, England will probably soon and justly claim first rank in dental honors—she is trimming sails evidently to that end. But whatever issue may come in that direction, it is certain that Dr. Chapin A. Harris, of

America, originated the measures which have brought to us all a great boon. And it has often surprised me when witnessing and reflecting on its wide application to the wants of mankind, that his countrymen, especially those who through it are coining wealth over the wide earth, should have neglected to manifest their appreciation of his merits, and their gratitude for his great services. Very truly yours,

"H. WILLIS BAXLEY."

This and subsequent institutions were fostered, cherished and endorsed by such worthy men as Parmly, Brown, Hayden, Harris, Flagg, Tucker, Harwood, Gardette, Townsend, Maynard and others—a noble array of brilliant, large-hearted natures, who as men of science, artists, poets, men of letters and cultivated gentlemen, would grace any circle and adorn any age.

The American Journal of Dental Science was established about this time, and was for many years the exponent and acknowledged organ of our profession; its pages were graced with contributions from the pens of some of the most distinguished writers of the country, not only within but from outside of our profession. In some instances men who are now of pre-eminent distinction as physicians and surgeons, made their first *entree* into the world of special literature through the pages of this Journal. Throughout its entire career, closing with the death of its chief editor Dr. Chapin A. Harris, one of nature's noblemen, the profession's foremost friend and benefactor, it was ably conducted, and took rank among the best quarterlies of the country, and to this day the young devotee of our art will be astonished to find how much that is new and interesting he will find on perusing its pages.

As we were dealing with the ultimate, and the laws which govern all forms of organic life, the microscope has been our invaluable aid, and among our numbers to-day will be found some of the best microscopists of the age. Through it the science of histology has been established in our own day, contributing abundantly to our profession as well as to others.

The study of the elements and the subtle agencies lays hold on chemistry, and no devotees have excelled those of our profession in this department—many of whom are distinguished, and regarded as authority in this specialty.

The profession of dentistry was made a necessity in consequence of the medical profession neglecting and practically ignoring the teeth and their functions, and all their direct and reflective relations to the human economy. So far from pointing out means and measures to preserve these organs from future destruction, they had adopted a succession of methods that were merely temporizing and palliative in their character, and by a series of inverted chemistry and dietetics, had not only virtually destroyed the teeth of

generations by robbing them of their rightful primal elements, but had projected their destructive tendencies into every avenue of the sacred citadel itself. So that as a people we had become physically, proverbially degenerated, and it became almost a question to benevolence and wisdom, whether if the standard of humanity fell much lower, the race would be worth perpetuating.

At this stage of the world's history, our own profession, born of the age's great necessity, came to her succor and relief; while she was struggling under sorrow, pain, weakness and degeneracy, the penalty of her broken laws, God in his mercy silently yet manifestly proclaimed, as he had done before, that again "the fullness of time" had arrived, when the world's needs were imperative. And, through His inspirations up sprung an army of inventors, of prophets and high priests, to restore, redeem and bless our people.

In the language of one familiar to you all:

"The medical world, for want of the knowledge of minute anatomy, neglected to study the character and significance of the teeth, till from sheer necessity men sprung up to remedy the wholesale loss which was fast coming upon the people, of their masticatory organs.

These men began to look into the origin, development and decay of these neglected parts of the human body; and these studies have revealed the cells as the factors of function, and as the elements of tissues which are the seat of nutrition, healthy and unhealthy.

And thus from the sins of omission of the medical profession, was born the dental profession, who are now busily engaged in remedying the mistakes of their predecessors, whose chief result of their influence upon the race has been to shorten life by patching up poor constitutions, that, but for nursing and care, would never have come to maturity to propagate their deficiencies through their offspring.

A true benevolence would never have permitted this spawning of progeny that were poorly begotten, imperfectly gestated, and born tired and worthless into this world of work and worth.

We have recognized that the mouth was practically, as well as figuratively, the very door-way of life—that here, preparation for nutrition and elementary vitality began, and that what was appropriated and properly manipulated here, through the processes of mastication, comminution, masceration and insalivation, would subsequently be assimilated into cell-building, and, progressively into man, brain, mind, and soul-building to its highest normality.

We stand as sentinels and watchmen at this sacred portal, to guard and to defend, in the light of all of the errors of the past and the inspirations

and teachings of the hour, to help physical, mental, moral, and with it spiritual humanity, upon her feet again to her loftier and lost standard.

Think of the many ways in which we have contributed to the happiness and prolongation of human life. Our treatment, as a rule, is neither experimental nor palliative, but *direct* and *sure*, and is rapidly approaching the standard of an exact science.

Starting with the infant in its cradle, our art, if duly applied to, is capable of staying, to a large degree, the tide of death that heretofore overwhelmed the helpless subjects of teething.

We minister to enfeebled children, and exempt them from long vigils with disorganizing pains that would have undermined their feeble natures, and would have crushed them to the earth; or, we ensure them a normal denture and healthy functions, by which they are enabled to vivify themselves over the dangerous chasm that lies between youth and manhood.

Our patients of mature years are oftentimes diverted from acute and chronic disease of the most alarming nature, by generous and special operations on the mouth, together with general treatment.

Diseases of the gastric membranes are largely modified by treatment that comes from the dentist's hand alone.

Nothing is more common than to have that "king of terrors," dyspepsia, which underlies so many other causes to drag humanity down to the dust, take his departure permanently and forever when the renovating hand of the intelligent and thorough dentist has cleared out the vitiating sources of acrid and poisonous secretions that lay brooding and festering in the patient's mouth, and then restored his organs to their primal usefulness.

It is not uncommon to find well marked cases of progressive consumption yield to the treatment that is directed to the buccal cavity alone.

All of the diseases incident to the superior and inferior maxillary, including those of the antrum, we claim as our own special field of labor, and we have already become acknowledged authority and teachers in this department; here the medical and surgical profession have bowed to our superiority, and are glad to sit at our feet and learn wisdom.

To old age we insure all the functions of mastication and assimilation as in their youth; we preserve the contour, keep the type, obliterate the peculiar marks of age, preserve the voice intact, and place the stamp of rich maturity where otherwise would be feebleness and dilapidation, and, by a judicious husbanding of forces, project their lives into a decade or two beyond. I am, of course, speaking in a comparative degree; but the essence of the truth is nevertheless the same.

As a part must ever be holden to the whole, and as we stand at the very

threshold, through which the stream of vitality has its rise and flow, whatever treatment shall result in a beneficial organic change to the teeth, must be shared by the whole system at large. If you infuse new earthy elements into the teeth, they must be extended to the bones generally, and the same tonic influence that was designed to localize within the tooth, is disseminated through and invigorates the whole system.

We seldom see an old man, now-a-days, of the olden times—

> "One whose nose is thin
> And rests upon his chin
> Like a staff;
> And a crook is in his back
> And a melancholy crack
> In his laugh!"—

with sunken cheeks and feeble and inarticulate voice. Our art has made them an almost extinct race, and the "toothless crone" is fast becoming obsolete.

Who can estimate all of these influences upon longevity?

Recent vital statistics, especially of the United States, recognize the great fact that the term of human life is gradually and surely becoming extended, without attempting to account for it.

It is becoming and right that to our profession the world is largely indebted to the change.

Our art deals with and has special reference to all which shall conduce to longevity. It is so generally practiced, so generally disseminated, and for such an extended period, that it is reasonable to expect that its influence should be marked and recognized, by this time. The entire teachings of our specialty makes us keenly alive, on the one hand, to every thing that shall promote the highest healthfulness and most extended vitality; and, on the other, to reject, to counteract and to overcome all invasions of the enemy, come in what destructive form he may.

We trust that before the next hundred years shall have passed away, we shall have so far diverted and overcome the cause of decayed teeth, that artificial teeth will, except in case of accident, neither be needed or known. We believe this may be among the possibilities of the future.

Though many of our dental colleges are indispensable to our art and its progress, and are doing a glorious work for it in the direction of dental education, yet none of them can ever make it complete, nothing will ever compensate for that general culture which comes from a larger and more extended course of study, and for those continuous and prolonged teachings, derived from the association of years, with the practical dentist at home.

In the language of another, "An exclusively dental education is an impossibility, for the plain reason that the processes of development, nutri-

tion, function, health and disease of any and every portion of the human system, must be understood to constitute the basis of any special manifestation of functional activity in any development or constituent of department throughout the whole range of the organic relations of the system to which they belong, and of which they constitute a part. Dental education then consists in a thoroughly complete classical course, and then a medical and surgical education, to which a concise knowledge of the teeth should be added, and then only have we attained the true type of a dental education

"The head, heart, and then the hand must be educated, if we desire a dental education worthy the transcendantly worthy position of a christian dentist."

I have already intimated what the dentist of the future should be. Having inherited so much, and being the custodian of so many talents, as well as the very honor of our profession, he will be recreant to his trust if he does not elevate and adorn his profession and exalt himself into the man *par excellence.*

All process of development of the planets and inhabitants of planets, goes from the general to the special. And special expression of complete development ever holds the culminated values of all of the steps and stages of the career, from inception to completion of productions of bodies or processes.

In like manner, we should look for the dental profession to be the special embodiment of all philosophy, science and art, it being the last upheaval in professional bodies.

In like manner the highest mountains are of the latest and most pronounced upheavals of the earth's crust, holding all the strata from the lowest to the highest, in which a single section reveals the whole order of form and development. In like manner ours should be the culmination of all sciences.

It is the glory of our profession that it yields opportunities for high and refining culture; we are continually associated with and have to do with the best of our race, with everything that is calculated to stimulate, to furbish up all of our powers, whether physical, moral or spiritual, to their highest capacity. Unlike most professions, we command leisure which they know not of, by which we have enviable advantages over them.

In conclusion, gentlemen, where in the long round of professions, arts and sciences, can be found one which is surrounded with worthier or more abundant influences, and which may contribute more toward the formation of the man for all time, than is ours? We should be co-workers with poets, historians and statesmen, "with the lovers of the true, the just and the useful; with the searchers into the mysteries of unwilling nature, making the winds and waters, the palpable and impalpable essences of things tributary to man; creating new gratifications for the body, and developing new capacities in the soul!"

REPORT OF THE COMMITTEE

ON

DENTAL EDUCATION.

By W. H. MORGAN, Chairman.

The last century of American development is remarkable for nothing more striking than the progress of dentistry.

Its sister branches of surgery laying claims, as they did, to the talent and energy which, as immediate necessities they evoked, had left dentistry far in the background, to await those social advancements from which the indications for its development must ever spring. And there is nothing which more clearly indicates the character of American civilization than the birth and rapid growth, within the last century of American freedom, of a science so necessary to social and personal comfort and well-being. Growing thus rapidly into collossal proportions and relations, it becomes at once a question of vital interest as to the nature and character of the development which shall mark its future history. Up to a late date, whatever of progress it had made, was due almost entirely to individual energy, industry and effort. The enthusiasm of its devotees has been the palladium of its strength and growth. But its developments have become too expanded, its appliances too extended for individual skill, however zealously applied. Disintegration of effort, at the present stage of development, would prove utterly paralyzing to its further progress; concentration of effort is the watchword of the hour that ushers in the Centennial year.

We have reached a period of time when the work of accumulation is even more important than investigation, and the manipulation of materials of more importance than their evolution or production. We are in danger

of having the pathway of progress blocked up by the very piling up of disintegrated or separate facts. We need arrangement, classification, order; and this is not the work of an individual, but of an organization.

The preparation of material for proper assimilation, in the mind of the beginner, is, or ought to be the first office of the teacher, and it is to this work that it behooves the men and institutions which stand out as the exponents and teachers of dentistry to address themselves earnestly and energetically at the present time.

Dentistry, in its every essence, is part and parcel of general surgery, and like all other specialties, should be developed *pari passu* with the various branches of learning and science which enter into the formation of the general science. These several branches cohere by virtue of those broad principles which run like threads through the ever crystalizing beads of facts, and it is only by this concentrating, this centralization of facts, that they can ever be seen in their true relations.

Whenever dentistry degenerates into a mere system of convention, independently of those general and fundamental principles which fix its true relations to general surgery, its doom as a science is fixed and sealed. The shop windows of the great metropolis of the old world, (and of the new, too, for that matter), filled with the tools of the tradesman within, and the ticketed rates of his labor, afford us a lamentable example of the divorce of dentistry from general surgery and honorable medicine. The high standard of some of our schools of dentistry has done much towards professional elevation, as well as the material development of the science. But our work is incomplete. While the professional relations between the graduate of medicine and the graduate of dentistry are pleasant, it is useless to deny that they are not yet what they should be, nor will they be until dentistry shall have become enrolled under the colors of general surgery as part of that organic university system, which experience has demonstrated to be the only true basis of systematic education.

Am I going too far in the spirit of reform, when I say that the degree of D. D. S., or D. M. D., should never be conferred, except as an appendage to the broader degree of M. D.? Have we not the same right to the general title of M. D. as the ophtholmologist and aurist, and are there not the same cogent reasons that we should possess it? Are the relations of ophtholmology and otology with medicine more intimate than those of dentistry and general surgery? Not at all; and we surrender what is our just and equal right when we give up the broad bearing of the one title for the contracted signification of the other. It is useless, in a report like this, to prate of the standard, or of any of the details of dental education. These things regulate themselves, to a large extent, for colleges, like liquids, will arrange themselves in the order of their specific gravities. It belongs to us, on this

occasion, merely to mark out the general bearings of dental education and determine its true relations.

In comparing English and German universities, Mathew Arnold has well said that in the latter the effort of the university is to bring all that is possible out of a man (educo—education, leading out), while in the former it is to cram all that is possible into him.

To apply this sage remark to dentistry, we think that in the development of our school system America, should strike the happy mean between the two. The science of dentistry is teeming with facts; these are to be collected, classified and presented in order to the mind of the student, while at the same time there should be given to him that impetus to original research, which only an enthusiastic appreciation of these facts can impart. We have no system to offer beyond that afforded by the general university. Here, the contact of mind with mind in the different fields of research, does much to stimulate individual energy, and to direct individual thought.

As there is no one truth in this great universe of God that is not connected with every other truth, so there is no science that does not interdigitate with every other science in the grand evolution of thought. We have our part, and a great one it is to perform, in this great work of development. Our past may challenge boldly the criticism of the world. But ours is not a positive science; new processes, new relations, new methods are constantly being evolved, and the work of classification is vast indeed. The countenance and support of the world is already ours. To-day, our science is regarded as one of the most prominent landmarks of civilization, and the demand for its development is growing more and more imperative each day. Let us not disappoint the hopes which have been raised, but through energy and wisdom carry the standard of our science into the very vanguard of human progress.

VOLUNTEER PAPER

ON

DENTAL EDUCATION.

By E. WILSON, Havanna, Cuba.

Mr. President and Gentlemen of the American Dental Association:

The subject of the paper I am about to read is one that is and must ever be of capital interest to the profession.

It is by no means novel; indeed, it has been frequently and variously discussed in this and other bodies of our members; but so far as I am aware, we have not yet reached, through such discussion, any definite or even proximate accord.

These conferences have been instructive, as showing how widely the need is felt for some shaping modification in the plan of our educational body, and the wide diversity of ideas developed serve to demonstrate how great and pressing is this necessity.

Also the subject comes before us with a peculiar interest at this particular meeting, which is in some sense the Centennial anniversary of the existence of our art, equally with that of our political existence as a nation, and, therefore, is a time of retrospective examination of the road already traveled over, and of high resolves as to our future course.

There has been a good deal said of late in regard to our status in the estimation of the public and that of other professions, and of a supposed tendency to depreciate the eminent services we have rendered and are rendering to society. I think, therefore, we owe it to ourselves to consider calmly and fairly the exact quality and quantity of the merits acquired and

for which we claim respect; as, also, the most effective methods of augmenting those merits.

One of these will be by raising the largest numerical proportion of those already in our profession to a high standard of excellence, and to discourage, as far as may be, the entrance into it of those of inferior grades of preparation; because such men must count for their full numerical weight in any general estimate of our quality.

Those disposed to complain of our present status should not forget that it must be determined by the aggregate quality of the profession as a whole, and not by that of our best men; and also that in any comparison of status with other professions, the question of *general culture* must inevitably enter as an influential element in such comparison.

Whether we are and ought to be considered as medical specialists, I think will best appear after a thorough consideration of certain points, on which it is the object of this paper to provoke discussion.

Before proceeding, however, I desire to file as a caveat to guard against misconception, the statement that in any criticism I may make upon our profession, I make it as a dentist trying to look the facts squarely in the face, in the interest of his chosen profession and in the kindest fraternal spirit.

Now has a profession or art, whose professors in the United States alone number at least eight thousand, and of which about one thousand have been graduated by the dental schools, and perhaps one hundred by the medical colleges, few more of which have received any degree, either literary or scientific, any reasonable grounds for claiming equal status with a profession, the whole body of which, with few exceptions, have had the greatest advantage of regular literary and scientific training and graduation?

No one of us who has been more than a quarter century in ours, and is familiar with its history, will have failed to recognized how exclusively its origin and development have been in obedience to the natural laws of demand and supply, acting upon an enterprising people of peculiar mechanical tact and perseverance.

At an epoch when extraction was the chief remedy for decaying teeth, it resulted that more of these organs were sacrificed and lost than in modern times, and its effects upon personal comfort and health did not fail to force themselves upon the attention of practical experience and progressive physiology, and these gave rise to attempts to compensate their loss by artificial substitutes, and to arrest their decay by plugging.

We can now look back upon the record of a century, and with honest pride challenge comparison with any art that competes with us in this cen-

tenary year. Indeed, this pride is shared with us by the nation at large, as one of our peculiar and most brilliant national developments.

No art has surpassed ours in the enthusiasm with which it has been cultivated; none in the variety and cunning of its methods, instruments and machinery; none have advanced more rapidly in the value of its services rendered, and in consequent public esteem, which on the whole I think has fully kept pace with our increasing usefulness.

Do not forget that I speak of aggregates.

Now, what is the exact quality and limit of our services to society up to the present time?

Taken in the aggregate, I trow that no fair and clear mind will fail to see that they have been almost exclusively mechanical—chiefly limited to the mechanical operations of plugging for the arrest of decay, and the replacing of those lost by artificial substitutes. The merits we have acquired with society by the efficacy of these services are unquestionably great, and duly recognized by the more intelligent of society.

Taking as samples the work of our best men, we have perhaps reached a degree of excellence that we may not be able greatly to surpass as regards those cases which are uncomplicated by marked pathological conditions of the pulp or other soft tissues; but as we are dealing with aggregates, I apprehend we have still ample road before us, in order to bring the profession up to that standard of excellence.

In this however we are making fair progress by the means at present in operation or in prospect, and for the purposes of this paper we may pass to the all-important question: How may we augment our usefulness to society?

From supplying substitutes for lost organs and preventing or retarding such loss, our power to save has extended to most cases not complicated by pathological conditions of the soft tissues.

Now, what field lies next to and immediately before us in the direct line of our development, and through which we must necessarily extend?

Clearly it is the treatment of those pathological conditions of pulp and dentine and contiguous tissues inseparable from dental diseases, too often involving the loss of those organs, and in regard to which the most intelligent are still groping in the morning twilight.

We are here face to face with therapeutical problems which concern some of the most delicate tissues of the human body, complicated by most unfavorable relations to hard tissues, which greatly augment the severity of disease and the difficulties of its treatment.

This, gentlemen, to my apprehension, solves the question as to whether we ought to be medical specialists.

As to whether we are now such, as a body, in view of present acquirements, I doubt if it can be fairly claimed for us.

It is irrelevant to consider whether the average dentist or physician of the day has most intelligence for the treatment of dental and oral disease.

The physician has little or no contact with, and consequently little or no opportunity for, systematic observation and study of it, while the dentist is in direct and constant contact, and by force of habit acquires a certain amount of practical tact in its simpler forms, but lacks the indispensable qualifications for its successful cultivation as a science.

The physician having these qualifications, lacks the opportunity, and thus is behind the dentist in this matter. The one has the preparation without the opportunity, the other the opportunity without competent preparation.

The question is not, therefore, whether we are to encroach upon ground already occupied, but whether we are to blunder on blindly in a new field directly and exclusively in our line of development, or are we to enter it with such qualifications as will secure the best possible results to society

In our progressive development we have now reached a limit beyond which science must open for us the way. We must educate and organize for this a sufficient body up to the front rank of what science has already demonstrated in anatomical, histological, chemical, pathological and therapeutical laws, make them familiar with all the best scientific methods, and well disciplined as to how and what to observe.

In this way we will, after ten years, have accumulated a fund of demonstrable facts, which will enable us to develop upon a sure progressive basis, and settle the question of our professional status.

The time has gone by in which science was constructed from theories alone, securing only such facts as conform to these. We know to-day that theories are only the staging which assists us in raising the edifice, which must be of solid facts or it will not stand; these stagings each time to be varied as a new elevation is reached.

Hitherto in our discussion of dental therapeutics, I fear that our stagings have been out of just proportions to the building materials accumulated. These stagings have been formed in great variety and ingenuity, but many granite blocks are still to be quarried before our edifice can go successfully forward.

To those who would ask me why our medically educated members have not made greater developments, I would answer, that isolated individual efforts seldom make rapid progress; well instructed, organized and disciplined bodies quickly overrun empires that are impregnable to individual assaults.

Who in our advanced ranks does not see that much of our present therapeutics are unphilosophical, especially the general practice of killing exposed pulps and filling their canals?

What would be thought of the physician who, when called to cure, would as a rule propose to kill with caustics and then amputate the diseased member, instead of conducting it back to a state of health?

If we are to accomplish this latter, the sooner we get rid of the idea that we are to discover panaceas, and direct our efforts towards discovering and removing the obstacles to physiological conditions, the sooner we will be on the road to success. We must take our places as humble assistants of nature, and to do this, we must first be her apprentices.

It is absolutely indispensable that we shall know intimately and thoroughly what are physiological conditions, and next, how the accidents and obstacles to which they are liable, are brought about. Knowing these, the door is opened to improved therapeutical ways and means. This knowledge is not to be acquired with only elementary science, as our past experience has demonstrated.

How and where is it to be obtained, or what is an effective preparation for obtaining it?

In an article published in 1868 in the *Revista Medico Quiurgica y Dentistico* of Habana, of which I was at that time the editor, I wrote in regard to dental education:

"I by no means advocate the abandonment of the present dental colleges, but the limit of their teaching to matters peculiar to the specialty, the same as it is in the schools of ophthalmology; those have the same reasons for existence as do these, and for graduation in them the presentation of a medical diploma should be one of the conditions, as it is in these ophthalmic schools."

My opinions upon this point have not greatly changed. I can think of no sufficient reason why the chairs of anatomy, physiology, chemistry, general pathology and therapeutics should not be eliminated from our dental schools, in view of far greater facilities for teaching those branches being accessible in our medical universities, and it is therefore an extravagance to support in such close proximity two faculties for one and the same object.

In the preparation of our young men, the question should ever be before us: What branches of science are necessary for them to master, and where can they be acquired with most facility and perfection?

I apprehend that those who in the future enter the dental field as liberally educated physicians and surgeons, plus proper dental and mechanical training, will find ample field and appropriate rewards.

The medical profession is overflowing, and perhaps the only reason this class of young men has not poured into our ranks is, that hitherto ours has not been generally conceded to be a learned profession.

Well, let us make it a learned profession, and our problem will be solved!

I do not believe, as Dr. Frank Hamilton has suggested, that those who graduate in medical universities will not be content to practice the "lower branches"—"that this would be like trying to stand a cone upon its apex instead of its base."

A specialty so educated would not be a "lower branch."

A specialty is a development beyond and above general medicine, which is its base, just as a branch is a higher growth of the tree, and bearing its most perfect fruits.

A medical specialty represents in no sense merely the apex of a cone! It represents the entire cone, apex and base, its apex rising to a higher level of usefulness, standing firmer and penetrating further because of its broader base.

Gentlemen, when a considerable proportion of us are liberally educated, we will not require to descend in order to practice our art; we shall thereby carry our art with us up to that level. Nor with proper training can I understand how our mechanical and artistic skill may be less, because of our scientific culture being more.

What we require is not a smattering of science, but a thorough familiarity that can throw light upon our path. They must be well trained in the best scientific methods of observation, recognition and record of facts, and their collation and mathematical manipulation into theories that will bear the tests of time. With our main body raised to this standard, and with our present means of intercommunication, our profession will have a most gratifying future.

REPORT OF THE COMMITTEE

ON

INSTRUMENTS AND APPLIANCES.

Mr. President and Gentlemen of the American Dental Association:

The committee on dental appliances beg leave to make their report, as follows; but before presenting the same, will you allow us a word as a sort of preamble?

Last year, at Niagara Falls, we asked as an especial favor to your committee, that as many as could, who intended bringing before this body this year any new inventions or appliances, would send to your committee (who have this anything but easy or pleasant task on our hands of examining their productions, and presenting the same to your notice,) as far in advance of our time of meeting as possible, that we might have abundant time to thoroughly test them and give a fair and intelligent report of their merits. This suggestion has not been in one single case acted upon. Again, as last year, we have had a perfect avalanche of new productions heaped upon us, and, as the go-between, between you and them, we are required to make a not only readable report, but one that shall give satisfaction, not only to this honorable body, but also to those who have given much time and labor to the perfection of their different appliances and inventions. In this, gentlemen, we are afraid we shall, in a measure, fail; for, in the limited time given us for the performance of our duty, we feel that we can not do either you, them, or ourselves justice. So, begging the indulgence of all parties concerned, we shall make our report as brief as possible, and, by simply giving you a list of such things as have been brought before us, and stating the names of inventors, and the merits they claim for their different inventions, we shall seek to throw from our shoulders any and all responsi-

bility that we should feel rested upon us should we attempt to go into a detailed explanation of the many things that have been passed before us in rapid review.

From S. S. White's house we have quite a number of new inventions. Of their workmanship we need say nothing, for the stamp of this house is sufficient guarantee of their excellence.

First, a burr and drill rack for holding points used in the engine. A very neat little device, folding up like a fan when not in use, but when on duty, the simple touch of a spring causes the five leaves, of which it is composed, to open and expose in very convenient form a bristling array of about one hundred points.

Next, a wedge-cutter and compressor combined, the design of Dr. Miller. There seems to be not much that is novel about this little appliance, yet it fills a place upon our operating tables that could not well be left vacant.

Again, presented by the same house, is E. P. Brown's compressed rubber dam. The idea here suggested may be of much benefit, yet, none of your committee ever having experimented with it, we are not prepared to say any more than that it is in the market. This, gentlemen, is a patent, and we will simply say, that as Dr. Barnum, in the largness of his heart, saw fit to give, without hope of compensation, the rubber dam to our profession, we think it in poor taste for another to follow on his heels, using his brains, and claim a draft upon our pockets.

A set of four instruments, for the introduction of os artificiel fillings, with platina points, for the purpose of obviating the corroding of the points, which is very apt to take place with steel points, was presented from the same house.

S. S. White also presents a set of six scalers, designed by Dr. Benjamin Lord. These are nearly the same that received our attention last year, though they have been somewhat changed and improved.

Dr. H. Weston's set of twelve pluggers for amalgam, from the same exhibitor, were examined by us; the points are finely serrated, the handles octagon in shape, and they may be considered as just what is required for amalgam work.

A set of seven instruments was shown, the design of Dr. Atkinson, for use in introducing oxy-chloride of zinc fillings, from the same house.

An automatic plugger, the invention of Dr. A. H. Stevens, was presented by the same. This instrument has been reported on by us before, but since that time has been improved very much, and has also been so arranged that it can be attached to the burring engine, and it seems to us that it is a very useful little instrument.

S. S. White presents, also, a set of thirteen pluggers for gold work. They are the result of Dr. Chappel's ingenuity, and are designed more for the purpose of restoring crowns than for the ordinary work of filling teeth. They are very beautifully made.

The electric mallet, as improved by Dr. Webb, was again brought to our notice, he claiming for it an improvement over the instrument presented last year, by a reduction in both size and weight.

Dr. Geo. H. Cushings' changeable-angle disk-carrier we also examined. It is so arranged that the disk may be set at any angle needed. The simplicity of its design, and the perfect manner in which it does its work, make it a valuable adjunct to the operating case. Manufactured by S. S. White.

The same manufacturer also exhibited a similar one of his own. This differs somewhat from the above, in that it runs at but one angle, and has an attachment by which the motion of the disk may be instantly stopped, while the engine wheel is still in motion.

S. S. White presented two lock-bit angle attachments for the burring engine, one being a right angle, and the other giving a more acute back-action. The novelty of this instrument consists in the lock of the burrs, which is an improvement on the screw heretofore used.

From S. S. White, also, we have a little flexible rubber shield for the burring engine, the object of which device is to prevent the polishing powders used in dressing down fillings, from getting into the journal at the point of the hand piece.

Two little circular tooth brushes, designed for polishing and cleaning teeth, and to be used with the engine, and also a steel brush for cleaning out files and burrs, were presented by the same exhibitor.

A set of flexible nerve-cavity drills and burrs, to be used with the engine, was examined. They will be found very useful in many cases; these, also, are from White.

A movable extension spittoon was also examined, which has several valuable movements. It admits of a lateral movement of some ten inches, revolves on its pedestal, can be raised and lowered several inches, and, if desired, can be attached to an extension bracket. This, also, was from the house of S. S. White.

One of the finest and most useful appliances brought to our notice, was S. S. White's new operating chair. We would like to give a more detailed description of this new improvement than our limited time will admit of. A few of its points of excellence, however, we will mention. Its foot-board is self-sustaining at any point within its range; at its termination is an additional fixed rest, six inches above the platform; to this additional rest is attached a supplementary foot-bar, pivoted so that it can be thrown up

twelve inches above the platform, bringing it level with the seat, and shortening the distance for children. The whole body of the chair revolves on its base, but can be locked at any point desired, and thus become immovable. The head rest has many advantages, among which may be mentioned lightness and strength, facility and range of movement, and comfort and convenience to both patient and operator.

Dr. E. Honsinger presented for our inspection what he terms his rotating gum lancet. This little instrument is intended to adapt itself to any side of the tooth to which it may be applied, the blade of the lance being pivoted to the handle and its surface concave, admits of its adapting itself very neatly to any portion of the tooth.

From Johnson Bros. we have a new gutta percha stopping. They claim for it some advantages over any other of a similar character now in the market; among others, its being less sticky and nearer the natural color of the tooth.

James Leslie presented a very beautiful specimen of his crystaline gold. This gold has some very excellent qualities, which can only be appreciated by testing them.

Dr. Williams, of Philadelphia, sent in for our examination a pneumatic mallet. We much regret that there was not some one present who was competent to explain its workings, for, from the limited knowledge we could gain of its powers, we were quite favorably impressed with it, and are sorry that we can not give it a more favorable notice.

S. S. White shows a set of seven scalers, designed by Dr. W. H. Atkinson. They are especially adapted to the removal of tartar from the lingual surfaces of the inferior incisors, fitting very nicely around the necks of the teeth, as none others do that we have seen.

He also shows some soft rubber polishing wheels, corrugated, thereby increasing the amount of surface, without increasing the size of the wheel. There are a half dozen different sizes and shapes.

A rotary file-carrier and porte-polisher is also shown by the same manufacturer, which can be attached to any engine, and seems to possess the merit of being less liable to get out of order than any we have seen.

Mess. Snow & Lewis, of Buffalo, show a hydraulic saliva pump, that can be attached to the wall, near the chair, and used to decided advantage, where the flow of saliva is abundant. It is a very ingenious appliance, and must be seen to be appreciated.

They also present an improved automatic plugger, having added two taper collars to the socket piece, thereby obviating any lateral motion, which is, in our opinion, a decided improvement in the instrument.

Dr. Bonwill again presents his electro-magnetic plugger for the exam-

ination of this committee, his claim for again bringing it before us being, that he has made some changes in the same that add much to its usefulness and ease in operating. Among the improvements may be mentioned its reduction in weight some two ounces, and in length one inch. The automatic break has also been so simplified as to render it, with the smaller magnets, more powerful than when triple the size. We believe it an instrument that has but to be tried to insure for itself golden opinions and a place in every dental office.

Dr. Bonwill's dental engine was also placed in exhibition before us, but as this instrument was reported on last year, we do not feel called upon to give it another notice, as it has not been materially changed since last presented.

The same inventor exhibited a disk-carrier, quite simple in its construction, cheap in price and effective in design. It commends itself to your favorable notice.

From the same, a hard rubber corundom disk. These are undoubtedly a valuable invention, and would meet with a ready sale were they in the market, though we understand they are not, but it is expected that they will be soon.

Among the more important appliances in operative dentistry are the following novelties:

A fountain spittoon of very elegant design and excellent workmanship, by Johnston Brothers. An important advantage which it possesses is its adjustability, both as to height and position, having a range in each direction of nearly two feet. Combined with it is a gold-trap. The construction of the whole is quite simple, and would seem unlikely to get out of order.

A portable and adjustable screen, by the same house, strikes us as likely to prove very convenient in many cases. It is capable of being easily managed and put into a small compass should occasion require.

The Morrison chair shown has undergone some improvements since our last report. A new head rest has been applied, and the whole chair is more comfortably upholstered. We believe that it is of advantage to have the operating chair more liberally furnished than has of late years been done.

An extension treadle, with toggle joint, was mentioned last year, but it is claimed to have been improved since then.

A disk-stand, with cups convenient for holding polishing pastes; an instrument-stand, the device of Dr. Fitch, capable of being readily shut up to lay away, are mentioned as new conveniences; also a form of screw mandrel, for holding soft disks of rubber or leather, having points upon the collar to prevent the disk from slipping.

The ingenuity of Dr. W. S. Elliott has furnished us, in this department

with two new appliances of seeming merit—a cheek distender, combined with reflectors, and a saliva ejector, to be used in connection with a fountain spittoon.

A root forcep and screw combined, the invention of Dr. French, we think will, in some cases, be found very useful. It bears some resemblance to the Huhlihen forcep, but has only a single blade, which, by the closure of the handles, is forced up between the root and socket, giving a better hold.

A set of instruments, designed by Dr. Bronson, for filling with gutta percha, are very neatly made and well adapted for the purpose intended.

An improved syringe is shown, with a simple device for self-charging, suggested by Dr. Brockway, It has been highly commended for its convenience.

All the articles thus far mentioned, as well as an improved jack-screw for regulating teeth, the device of Dr. Southworth, were shown by Johnson Brothers.

The Buffalo Dental Manufacturing Co. show Snow & Lewis' automatic plugger, claiming for it recent improvements.

R. S. Williams brought to our notice a regulating screw made by Dr. Littig, intended to be used in connection with a plate for altering the position of teeth. We believe it will be found useful. He also called attention to a number of new forms of gold foil which are convenient to use. In one of the varieties designed to be used as non-cohesive, the quality is produced by the admission of a very minute portion of tin; in the other, the surface of the foil is covered with a slight film of carbon; in neither case is the effect visible in the appearance of the gold, but it is claimed to improve its working quality.

The automatic mallet of Dr. Salmon has been modified to its advantage, as he claims, and as we believe.

Dr. W. N. Morrison brought to our notice a screw-porte for adjusting retaining screws in the cavities of teeth. The contained wire having a thread ready cut upon it, permits of the screw being made of any desired length and cut off as required—a manifest advantage in some cases.

We desire to make favorable mention of a box for holding dentifrice, the device of Dr. Lyon. It has a hinged cover, is made of seamless tin neatly ornamented, and will, we think, be found very admirable for the purpose intended.

A set of exploring instruments, embodying suggestions of Drs. Jack, Perry and Brockway, will meet a need not heretofore supplied, for instruments wherewith a thorough examination of the teeth can be made in all cases.

We believe that the set of scalers devised by Dr. Riggs has not been mentioned before this body, and, although not entirely novel, they are well deserving of notice here. The same may be said of the smooth-point pluggers of Dr. Mills, which, like the foregoing articles, are also made by S. S. White. These are designed to be used with cohesive gold and by hand mallet.

Passing to the branch of mechanical dentistry, we find a new flask by Dr. French, intended for rubber or celluloid, having a spring, which, when the flask is brought together, snaps into a slot, giving notice of the complete closure of the flask, and holding in place the two sections. The idea is a good one.

Dr. Elliott has given us an improved articulator, which we can readily commend. Johnston Brothers make both this and the flask spoken of.

Dr. B. M. Wilkerson, of Baltimore, presents a vulcanizer, some features of which are entirely new, and those we will give you. This piece of work, when fully worked up in wax, is invested in the flask, which is firmly attached to the cover of the vulcanizer. The investing is different from any other manner heretofore presented; as the case is solidly invested, the flask will not admit of being separated. Then the whole thing is placed in the vulcanizer and steam raised, when the wax, by pressure of steam, is soon forced out through an opening of the cover. The rubber is then forced by a plunger driven home by a screw, through the same channel where the wax found exit, and the former place of the wax is thus filled with rubber. This ingenious appliance must be seen to be appreciated. It is not in the market as yet, but it soon will be.

A new preparation of rubber dam is presented by the Davidson Rubber Co., of Boston. It is claimed to be very elastic and durable, but of its virtues we can say nothing from personal experience.

GEO. L. FIELD,
A. H. BROCKWAY, } Committee.
G. R. THOMAS,

REPORT OF THE SPECIAL COMMITTEE

ON

THE STATUS OF DENTISTRY.

BY C. N. PEIRCE, CHAIRMAN.

Not unmindful of this occasion, I have prepared a short essay on the status of our profession which, if it be your pleasure and that of the association, I will present for their consideration. For most of the facts herein embraced I am indebted to the proof-sheets of the work just issued, embracing a history of dentistry in this country during the century just closed, and to an admirable essay by Dr. J. W. White, on porcelain teeth.

Though the day of jubilee has past, and the stirring eloquence that has so fitly portrayed the spirit and memories of the events which have given more than ordinary interest to the closing century are now matters of history, yet it is not inappropriate that we too, at this late hour, should take a retrospective view of the events in which our profession is most interested.

While the orators on our nation's birth-day have dwelt upon the grandeur of the work of 1776, and our debt to the public men of that age; of the spirit of the people, the results of the century, America's influence in history, augmentation in intelligence, individual advancement, etc., etc., we too may have a word of encouragement and cheer, showing that while public men have been filling up the measure of their capacity and answering the demands of their age, others more limited in their opportunities and less clamorous for notoriety, have filled equally well an essential place in society, and produced results commensurate with their efforts.

Any review of dentistry in this country which shall cover the whole of the past century, must commence at a period when the limited number of

inhabitants and the stirring political events necessarily precluded the possibility of any special importance being attached to the curative art. Those first seeking this field of labor were generally of a class deficient in theory and experience, dentistry suffering in this respect even more than medicine.

In consequence of this condition, in the year 1776, the practice of dentistry, so far as accurate information can determine, was quite unknown. Ten years previous, however, (1766) Robert Wofendale, of England, established himself here, but meeting with less success than he had anticipated. he remained but two years, returning in 1768. Twenty-nine years later, on coming again to this country, he found quite a change, as in the interval several gentlemen had become established in the profession. It is believed that Mr. Wofendale (1766–1768) inserted the first full artificial denture ever made in the United States, William Walton, of New York, being the patient. From the year 1768 to 1782 the names of Isaac Greenwood, of Boston, and Mr. Baker, of Philadelphia, are the only ones associated with the profession of dentistry in America.

In 1782, with the French army, came Mr. Joseph LeMair, who a year or two later practiced in Baltimore and Philadelphia. Of him, our *first American* dentist, Josiah Flagg, learned the art and commenced its practice. At the same time (1784) James Gardett arrived from France and settled in Philadelphia. About 1786 John Greenwood began practice in New York. where he had been preceded by his brother, Clark Greenwood. In 1804 Horace H. Hayden offered his professional services to the Baltimoreans. and in 1805 Edward Hudson commenced practice in Philadelphia and John Randall in Boston; and two years later (1807) Leonard Kœcker performed his first dental operations in Philadelphia. These were the fonnders of dentistry in this country, men in earnest, and pursuing their calling with a singleness of purpose which commanded position and success.

From this period accessions to their number were slow, though continuous, until in the year 1825 the whole number of all grades was estimated at two hundred and fifty.

Nearly fifty years had now elapsed since the adoption of the Declaration of Independence, and this limited number marks the growth of our profession. Contrasting this with the last six years, from 1870 to 1876, when the graduates from our dental colleges alone numbered nearly nine hundred, and with the fact that the total number of practitioners at present in the country falls but little if any short of 10,000, we see the comparatively insignificant position our profession held at that time.

Until the year 1800 a large portion of the dental practice was in the hands of the medical profession, whose efforts were chiefly directed to the extraction of teeth, and the treatment of odontalgia by systemic remedies and topical applications of poultices, etc.

With the great majority of practitioners, dental operations were extremely crude and limited, consisting chiefly in the removal of the natural organs and the manufacture and insertion of substitutes. Indeed the latter operation was the distinguishing feature between the dentist, so called, and the medical man. The filling of teeth (practiced to a limited extent) with tin, lead, gum-mastic and sandarach, and also the operation of filing for the removal of decay—the latter in the face of much opposition—was principally confined to the better class of dentists, many of whom were graduates in medicine, and pursued to a moderate extent that calling also. At this period artificial dentines were carved from ivory or bone. It was not until the year 1817, that mineral or porcelain teeth were introduced from France by Dr. A. A. Planton, and they were not in general use until some years later, human and animal teeth being much employed, set in ivory or bone bases, or held in the mouth by pivoting or ligatures. Upper sets were retained *in situ* by springs attached to the lower plate, or to clasps around the remaining natural teeth; while itinerant practitioners were inserting partial sets without plates of any kind, by simply stringing the teeth on gold or silver wire, anchored at the extremities to the remaining natural teeth by ligatures. The securing of artificial teeth on metallic bases grew but gradually in favor, until the announcement of the principle of atmospheric pressure by Dr. James Gardett, after which it rapidly became popular. Transplanting was also in vogue; Mr. Joseph LeMair, in the winter of 1785–'6, claimed to have transplanted one hundred and seventy-six teeth in Baltimore and its vicinity.

Such is but a brief and extremely condensed view of the condition of dentistry in this country at the beginning of the present century. To accurately trace its growth from the above primitive status to its present advanced position, would require much careful labor, which should only be intrusted to an experienced historian; therefore, what I shall present to you will be but an indication of what such a history should embrace.

ARTIFICAL TEETH.

As has been noted, the manufacture and insertion of artificial dentures constituted much the larger part of early dentistry, as an individual occupation. The carving of plates and very crude teeth from the varieties of ivory was at first the principal occupation of a dental student. But with the introduction of metallic bases and of procelain teeth, came not only the necessity for a knowledge of simple metallurgy, but also called for skill in the ceramic art.

The spirit of improvement which had become so thoroughly incorporated in the American heart, was not long in manifesting itself in this branch of dentistry. From the French and English systems of manufacture were

quickly evolved models and methods peculiarly American, which have ever remained distinctive features of mechanical dentistry in this country. Among those who zealously labored in this field, the names of Planton, Peal, Stockton, Alcock, Ambler, Spooner and McIlheny will be long held in remembrance.

Dr. A. A. Planton is entitled to the credit of being the first manufacturer of porcelain teeth in this country. He established himself in Philadelphia in 1817, and soon after, with the assistance of Abram Miller, whose pottery was then in Zane street, but afterwards in Willow, he commenced experimenting in the manufacture of porcelain teeth. In 1822 he brought before the Medical Society of Philadelphia the result of his labors, and from them received their certificate of approbation. Mr. Miller will long be remembered by the early manufacturers of teeth, not only for his efforts in furnishing them furnaces, muffles, slides, etc., but also for his kindness in communicating "his knowledge of pottery to the attainment of higher rerults in this new application of the fictile art."

Charles Wilson Peale, the next after Planton, was a public-spirited man, and much given to the study of scientific matters. The celebrated museum which bore his name was founded in 1775. He was also one of the founders of the Academy of Fine Arts, in Philadelphia. Mr. Peale, in 1822, though in his eighty-first year, spent much time in experimenting in the manufacture of mineral teeth, and with results highly satisfactory. But notwithstanding his success in this branch of the dental art, it was in the vocation of painter that he gained his most enduring reputation.

In 1825 Sam'l W. Stockton, of Burlington, N. J., commenced his experiments in the manufacture of mineral teeth. Following close upon him was Alexander Van Pelt and Joseph E. McIlheny, of Philadelphia; and a year later than these, (1828), was Hudson S. Burr, Lewis Roper, Robert McGrath and Daniel Neall, of the same city; D. C. Ambler, of N. Y.; J. R. Spooner, of Montreal, and in 1830, J. F. B. Flagg, of Providence, R. I., and J. F. Flagg, of Boston; followed, in 1831, by S. Spooner, of New York, and, in 1833, 1834 and 1835, by numerous gentlemen in New York, Boston, Cincinnati and Philadelphia, who, with varying success, increased the list of experimenters. Sam'l W. Stockton who, as above stated, began his experiments in 1825, was the first in the United States whose manufacture of mineral teeth attained any commercial importance. Most of those engaged in the business previous to him were practicing dentists, and manufactured exclusively for their own patients. To him belongs the credit of making the first effort to supply the profession with teeth, thereby relieving the dental practitioner from a duty so inconsistent with manipulative operations in the mouth. But his deficiency in scientific attainments and systematic accuracy in experiments—the latter so essential to satisfactory results—left yet a wide field for further improvement. This opportunity was not lost.

nor the field long without a laborer. Philadelphia furnished a young man, modest and retiring, though zealous and determined, and upon this work he entered in 1836, performing a series of experiments with a systematic accuracy which soon brought results far in advance of anything that had yet been obtained, and in less than two years Dr. Elias Wildman had the honor and unspeakable satisfaction of presenting to the profession teeth of such translucency and life-like appearance, and gum enamel, the color of which was so uniform and durable, that subsequent experiments to the present day have not surpassed them. "To him therefore must be awarded the credit of having reduced the manufacture of porcelain teeth to a scientific basis."

In 1844, a gentleman who is now with us, and whose interest and sympathies are so closely allied with those of our profession that it were useless to mention his name, having served an apprenticeship with his uncle, Sam'l W. Stockton, commenced the manufacture of incorruptible teeth, in an obscure room in a dwelling house, corner of Seventh and Race streets, Philadelphia. This was the initiatory step of an enterprise that has had no rival in the world, and with the history of which you, Mr. President and gentlemen of this association, are thoroughly familiar, under the firm name, at different times, of Sam'l S. White, Jones & White, Jones, White & McCurdy, then again Jones & White, and finally as at first, Sam'l S. White. The three-score and ten premiums from the various institutes, world's fairs, etc., which have been awarded to this firm, tell plainly the history of its success. The important improvements with which it stands accredited are too numerous to be here specified, but the extent of its fabrications and the demand for them by the profession at large, is a flattering eulogy upon Dr. Sam'l S. White's labors in behalf of the æsthetic and indispensable in an advancing profession.

The 4,000,000 teeth made annually in Mr. White's establishment, are probably about one-half of the annual production of the world, and mark a wonderful increase on the 500,000 which was the annual production of S. W. Stockton thirty-five years ago.

This large demand for teeth by dental practitioners, shows pretty conclusively that the manufacturing of teeth in private practice has been almost wholly abandoned, leaving the operator time for experiment in other fields, or for improvement in the branches of his specialty, which are more closely allied to the healing art.

From the original immature ivory base we may trace step by step the introduction of gold, silver and plantinum—at first bent into shape with pliers and punch, and subsequently swaged between metallic dies. Following after these, were the gutta percha base of Slayton; the molded tin base of Royce & Hawes; the cheoplastic process of Blandy; the porcelain base

of Loomis; the vulcanite base of Goodyear: the rose-pearl of McClelland; and celluloid, the latest production of all. Each of these has served a purpose, and as the practitioner has become familiar with their properties, his judgment has dictated the adaptability of either one or another for his special case.

The porcelain base has, from the first introduction of mineral teeth, been familiar to every manufacturer, but the difficulty of securing a perfect adaptation has confined its use to a limited number.

The methods of attaching artificial teeth to bases have been almost as varied as the bases themselves. The most crude of these was the pin through the tooth, retained *in situ* by being headed at both ends; then came the modifications of this, which were fastening the pin in the tooth by means of solder, sulphor, or amalgam. Following this was the pin soldered to the back of the tooth, the latter having been made with a piece of platinum therein. Next, metal flowed around the base of the teeth, in this way attaching them to the plate without pins. Vulcanite, amalgam, and finally porcelain were in this manner used, the latter so employed, though with some modifications, constituting Dr. John Allen's continuous gum work.

The securing of whole or partial sets in the mouth has always been a matter of interest and experiment. From the original, crude manner of tying with strings or wire, we have had numerous methods of varying utility. Lower sets were at one time loaded with metal, thus adding weight, that they might be held more securely by gravity. For upper sets, other means were necessary. Springs were first employed, but were discarded as better adaptation was obtained, and the principle of atmospheric pressure was recognized. Modifications of this principle have been suggested by Harris, Cleveland, Gilbert, Flagg, Dwinelle, and others, but with none are the results so generally satisfactory as with the original simple depression in the plate, which really supersedes all other methods for securing a full upper set in the mouth.

The operation of ingrafting with a wooden pivot a tooth upon a healthy, though pulpless, root, was one of early date; and simple and easily accomplished, as it was and is, there has been but little room for any great improvement. But the substitution of metal for wood, with the various means of retaining it in place, has made the operation practicable in a much larger number of cases, and in some of these an opportunity has been afforded for the most exquisite workmanship, securing, when embraced, results that will stand for years as monuments to patience and skill.

There is probably no operation, in this department of our art, that gives such complete satisfaction to the patient as a nicely-adjusted and permanently-secured pivot tooth.

In the transplantation and replantation of teeth, which was first publicly

noticed and strongly advocated by Hunter in 1771, there has been but comparatively little done, save for a short period immediately following the appearance of his paper in this country. The operation known as torsion, for the correction of irregularities, has also been practiced to but a limited extent, in consequence of the liability of unfavorable results.

We come now to the operation of filling teeth, and ancient though it be, it was long practiced with but little regard to physiological or pathological conditions.

Lead, gold and the gums (*sandu-rach* and mastic) constituted the list of materials first in use in this country. The first named, lead, was for many years, almost universally employed, but was eventually displaced by tin, which proved superior in value in most cases, and is still widely used and highly prized by many good operators. The resinous materials not proving durable, were never much used in American dentistry.

Gold, introduced here about 1795, has since held the most prominent position among materials for filling. The great variety of forms in which it has been presented to the profession, are familiar to you all. Suffice it to say, they have been so numerous that each operator could experiment to the extent of his inclination, and with most of the varieties excellent work has been done, though probably with some kinds more labor has been required to produce satisfactory results.

Next to gold, the three most prominent materials now used are amalgam, oxy-chloride of zinc, and gutta percha in some form. The first of these introduced here in 1833 by the Crawcours, two French empirics, was soon after the cause of an exceedingly prolonged and bitter controversy, a commotion which has passed into history as the "Amalgam War." With various modifications and improvements in its composition, it has now become a standard material and almost universally used, there being but very few out of the whole number of dental practitioners who do not, in special cases, resort to it.

The second, oxy-chloride of zinc, is in general use, but its great value consists in its appropriateness for temporary fillings, and in the protection of exposed or nearly exposed pulps, enabling the dentist to protect and preserve the vitality of the pulp in a much larger proportion of cases than hitherto.

Gutta percha, either in the form of the pink preparation, or that of Hill's stopping, (made of gutta percha and pulverized spar,) is also in general use, and quite indispensible to every good practitioner for temporary fillings in sensitive teeth, as well as those affected by periostitis. The fusible metals, at one time, were considerably employed, but results were so unsatisfactory that they are now entirely discarded.

The treatment of dental caries has widely varied with the different theories that have been advanced and sustained in reference to its cause. At one time it was supposed to arise wholly from systemic conditions; at another referred exclusively to outward and local circumstances. The first we may term the vital, the second the chemical theory. Then came the theory, which was almost universally accepted, termed the chemico-vital. At times there have been advocates of what is termed the parasitic theory, but these have not, at any period, been prominent in this country. The low forms of life so readily recognized in the cavity of decay, have generally been assigned the position of a sequence, rather than a cause, by most of those who have given the subject attention.

It is in and through this department—the treatment of dental caries—that the profession has gained its position and reputation. The assiduous and uncompromising efforts for the preservation and restoration of the natural teeth, which have been so persistent on the part of a large number of practitioners, have won for the profession a position in the ranks of the healing art, both creditable and compensating, and though, like other remunerative occupations, it has had a great proportion of empirical followers, yet the beneficial results flowing from the operations of the skilled and the conscientious, have been fully recognized.

In the anxious effort to save the natural teeth, there has, of necessity, been much done in the way of experiment and practices which, though at one time popular, have been abandoned for others thought to be more beneficial in results. In the treatment of the dentinal pulp, this has been unavoidable.

The effort at extirpation with a steel probe, both in connection with and without the actual cautery, gradually gave way to a less painful method, by previous devitalization with some preparation of arsenic, a process which was first used in 1834 by Dr. J. R. Spooner, of Montreal, but was not given to the profession until 1836, when his brother, Dr. Shearjashub Spooner, mentioned it in a small publication, entitled "A Guide to Sound Teeth."

The last ten years has greatly modified the use of this agent, the wise and physiological practice of capping exposed or nearly exposed pulps having largely taken its place. This method is not one of modern origin, by any means, for attempts at it are almost as old as the profession itself, but an increased pathological and therapeutical knowledge has rendered it much more effectual, so that now the proportion of successes is such as to make it orthodox practice. We may say, therefore, that the practice of pulp treatment has changed from that of destruction to that of preservation.

In connection with pulp treatment, risodontrophy has been employed by some to secure more thoroughly the health of the organs, and by others

to give vent to a dead and disorganizing tissue, and thereby averting periostitis and alveolar abscess.

One of the first dental operations upon record is that of tooth extraction, and for many years it was of chief importance in the reputation of the dentist, though practiced in the rural districts by physician and blacksmith, and in cities by barber and surgeon.

The instruments for the performance of this operation have varied much at different periods; the earlier ones were very crude, and at one period forceps were made of lead, to avoid the danger of fracture or injury to surrounding tissue, but these gave place to the key, which, in modified forms, for years and until quite recently, held a foremost place among extracting instruments. But this instrument is now almost entirely superseded by a class of forceps made with especial reference to the formation of each tooth, and in the hands of an educated dentist, are much more effectual in their execution.

With the extraction of teeth, the employment of anæsthetics is most intimately connected, since to a dentist and to this operation does the world owe its knowledge of the effects of two of the most valuable of these agents —ether and nitrous oxide gas. As to the true discoverer, there has been much vituperative discussion, but this has all passed into history, and the name of Horace Wells will always remain vivid in the minds of future generations, as one of the greatest benefactors of mankind.

We have noted above, but briefly and imperfectly, the various progressive practical stages through which the profession has passed, and by which it has rendered incalculable service to the public, and from them in return gained their confidence and an enviable regard second only to that awarded to the general medical practitioner.

To name in detail the multiplicity of aparatuses which have been so serviceable in the hands of the dental practitioner, would occupy more space than the limited time alloted to me would permit. Suffice it to say, that while they have greatly lessened the fatigue of his labor, they have increased its efficiency and excellence. Many of these instruments have been the result of genius in the profession. Would we could say it to the honor of such, that they had been given to the profession unincumbered by patents and royalties. One however, the rubber dam, above all others, must here receive notice; first, for its intrinsic and inestimable value, and second, for its being a free and generous gift from the inventor. Long may the name of Dr. S. C. Barnum be cherished in the hearts of members of the profession, and long may his spirit be emulated.

We have spoken of the progressive development of our profession, and the honorable position it occupies. A word or two now in reference to the

means which have been instrumental in its advancement, and to a few of the spirits who were efficient in securing these advantages.

This advancement has been stimulated by and, indeed, is largely due to the publication of journals, the formation of societies, and the establishment of colleges.

Of those whom we have enumerated as the founders of dentistry in this country, there is probably no one whose efforts were more wisely directed and persistent, and whose influence was more widely felt than was that of Horace H. Hayden. He was not alone in the work, but his high standard, exhaustless energy, and indomitable will, did more to systematize and give status to the profession than that of any other man. From the time he entered the profession in Baltimore, in 1804, until his death, he was constantly occupied with efforts for its advancement.

After numerous unsuccessful attempts, extending over several years, he was, in 1839, instrumental in starting the first dental periodical, the "American Journal of Dental Science," an important event in the history of dentistry. The scattered members of the profession who had long toiled in comparative obscurity, almost unknown to each other and to the world, found in this journal an appropriate medium through which to communicate with each other.

Soon following this publication, was the formation of the "American Society of Dental Surgeons," and at its second annual meeting an arrangement was made with the publishers of the Journal by which it became both the property and organ of the association. Two years afterwards, another society of dentists, like that in Baltimore, was organized in Richmond, Va., and in August, 1844, a third was formed in Cincinnatti, Ohio, styled the "Mississippi Valley Association of Dental Surgeons."

In August, 1850, the "National Convention of Dentists" was formed, and its first annual meeting was held in Philadelphia. Just previous to this, the "Pennsylvania Association of Dental Surgeons" was organized, and some years subsequent, in 1863, the "Odontographic Society," of Philadelphia.

In addition to these, there are some seventy other state and county societies, most of the latter professing to hold their meetings monthly.

The "American Society of Dental Surgeons" had rather a varied and turbulent existence; crimination and recrimination were indulged in to such an extent among its members that it was eventually destroyed. But notwithstanding this unfortunate termination, it left its imprint upon the profession in behalf of associated and systematic effort. Following close upon its demise, sprang up the "Mississippi Valley Association of Dental Surgeons," and the "Pennsylvania Association of Dental Surgeons." Both

of these are still in existence; the latter, for over twenty years, has not omitted its regular monthly meeting, and has largely contributed, not only to the greater professional excellence of its members, but has engendered among them a feeling of friendship and sympathy that is remarkable in professional life.

The establishment of the "American Dental Convention" was the outgrowth of the local associations, which were felt to be insufficient to answer the demands of the profession. But in a few years the necessity for a delegated and representative body was felt among the more advanced portion of its members. This desire rapidly grew, and finally became so definite and expressed, that at Niagara Falls, in 1859, largely through the effort of Prof. J. H. McQuillen, the "American Dental Association" was organized, with the election of Dr. Wm. H. Atkinson as its first president. This, from its character, has been the leading, most important and influential dental association in the United States, and, we trust, from the jealous care with which its annual conferences are guarded, it will long merit the reputation it has so justly won.

From the issuing of the "American Journal of Dental Science," afterwards called the "American Journal and Library of Dental Science," in 1839, by E. Parmly, E. Baker, and Solymon Brown, the first periodical in the world devoted exclusively to the interest of dentistry, the profession has recognized the advantages accruing from well directed dental journals, vehicles, as they are, for the interchange of thought. They are, when judiciously conducted, next to colleges, the most efficient instruments for improvement and education. Considering the possibility of placing one or more of them in the hands of the most obscure practitioner, we doubt if they should stand second to any other influence in promoting a desire for professional attainments and excellence in professional skill.

Of some thirty that have been started, the large majority have had but an ephemeral existence, but of even these, we trust, good can be recorded, in having stimulated some to a higher effort. The fact that of the surviving, the most prosperous and influential journal is published by a dental manufacturer, has been thought by many detrimental to its usefulness. While this may possibly be the case, to a limited extent, yet a compensation far outweighing this, is too conspicuous not to be worthy of mention. The interest the publisher has in extending the circulation of his journal, stimulates him to procure for it the best editorial and contributive talent, the result of which is thus brought within the reach of a much larger class of readers, for a pecuniary consideration much less than it could otherwise be obtained.

In the production of standard dental literature, America, it is feared, compares unfavorably with England. As we have sown, so shall we reap.

For years American dentists have almost exclusively given their undivided energies to securing excellence in practical work. Their methods and auxiliaries far exceed those of any other nation, and so, in the effort to gain proficiency in results, time has, to a great extent, been monopolized, with the sacrifice of mental culture. It is to be admitted, with much regret, that England excels us in giving to her dental student a higher degree of scientific attainment, a more liberal and thorough theoretical education; and while it is from these that most of the standard works must come, we of America must accept this unfavorable comparison. But in doing justice to foreign authors, let us not do injustice to our own. We have Parmly, Fitch, Harris, Bond, Taft, Arthur, Richardson, Garrettson and others, each of whom have marked an advance in our profession, and pointed to something higher.

Of these works, some are now only of historic value; others have become standards of reference, and a few are employed as text books in our colleges.

While dental schools and colleges were instituted through the energetic efforts of a few men of liberal views in the profession, their necessity was made most manifest by the cupidity and illiberal spirit that controlled a large portion. While private preceptorship was offered for a compensating fee, and the teacher was honest in imparting freely the best and, indeed, all that he possessed, the necessity for other means of education was not so keenly felt. But soon empyricism manifested itself in its worst form, through extortion in fees demanded, professional jealousies, and secret methods, until private studentships were an abortion, and schools of instruction became indispensable. Hence resulted the establishment of the following institutions:

The Baltimore College of Dental Surgery, the first institution of the kind in the world, was inaugurated in 1839. The Ohio Dental College was chartered in 1845. The Philadelphia College of Dental Surgery in 1850. From this college, after completing its fourth session, the faculty resigned, and in 1856 procured the charter of the Pennsylvania College of Dental Surgery. In 1863 the Philadelphia Dental College was chartered, and in 1865 the New York College of Dentistry. In 1866 the Missouri Dental College was founded, and in 1867 the Dental School of Harvard University. The Boston Dental College was instituted in 1868, and in 1873 the Maryland Dental College, and finally, in 1875, the Dental College of the University of Michigan held its first session. Two or three others have had an ephemeral existence, but never attained importance enough to give them an influence. Of these schools twelve are now in existence, and the whole number of degrees they have granted is about 2,370. The influence exerted by these in behalf of an advanced education has evidently been very great.

Since the establishment of these institutions of learning, their progress has been marked, and a definiteness in instruction has been attained which promises yet more rapid advance. This growing desire for a more liberal education is not confined to those holding connection with colleges. The former graduate and operator, with years of experience, daily feeling the embarrassment of his limited knowledge, demands a more liberal curriculum and a more extended and thorough general education, that this additional wisdom and strength may make his successor a more efficient and useful practitioner.

Whatever may be our present deficiency in giving instructions, compared with the private pupilage in vogue in the early part of this century, our advance has been highly creditable and almost unprecedented, though as we have intimated, much remains to be accomplished. Through practical results in prosthetic and æsthetic dentistry, we have little hesitation in claiming for the profession an influence for the improvement in both the physical and moral condition of society, and we do this with the knowledge that empyricism and dishonesty are active competitors; but the tenure of these is based upon ignorance, and therefore with the diffusion of education the influence of this class must gradually diminish.

In this hasty and imperfect sketch of the progress of our specialty during the century just passed, we have desired to avoid any unseemly idea that perfection had been attained. With the advance that every department is making, we are warranted in believing that the knowledge and the practice of to-day will seem as crude to those who shall celebrate the second Centennial of America, as do those of our predecessors to us.

Let us be content if the years in which we labor shall mark an advance which shall be recognized as permanent, and tend towards the end to which we all should aim—perfection.

1877.

TRANSACTIONS

OF THE

AMERICAN

Dental Association

AT ITS

SEVENTEENTH ANNUAL SESSION,

HELD AT CHICAGO,

AUGUST 7th, 8th, 9th and 10th, 1877.

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TRANSACTIONS

OF

The American Dental Association

AT ITS

SEVENTEENTH ANNUAL SESSION,

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AUGUST 7th, 8th, 9th, and 10th, 1877.

PUBLICATION COMMITTEE:

M. S. DEAN, G. H. CUSHING, H. JUDD.

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AUG
J. F. B.

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MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION,

SESSION OF 1877.

BY C. STODDARD SMITH, SECRETARY.

THE AMERICAN DENTAL ASSOCIATION assembled for its seventeenth annual session at the Grand Pacific Hotel, Chicago, on Tuesday, August 7th, 1877.

The President, DR. G. W. KEELY, called the meeting to order at 10 o'clock, A. M., and DR. MORGAN, of Nashville, opened the exercises with prayer.

The roll of qualified members was then called and the following members answered to their names; those marked with an * not being present but forwarding their dues:

ATKINSON, W. H.....41 E. 9th St., New York.
ALLPORT, W. W.....208 Wabash Ave., Chicago, Ill.
ALLEN, JOHN.....W. 34th St., New York.
*AMBLER, H. L.....114 Euclid Ave., Cleveland, O.
ANTES, R. H.....Geneseo, Ill.

BROCKWAY, A. H.....13 Greene Ave., Brooklyn, N. Y.
BARKER, G. T.....Philadelphia.
*BIRGE, J. J.....410 Kearney St., San Francisco, Cal.

BROWN, SENECA B.....Fort Wayne, Ind.
BROPHY, T. W.....126 State St., Chicago, Ill.
*BUTLER, C. R.....114 Euclid Ave., Cleveland, O.
BREWSTER, THOS. K.....Oskaloosa, Iowa.
BOGUE, E. A.....21 E. 20th St., New York.
*BRONSON, W. A.....8 E. 34th St., New York.
BILLING, H. J.....Louisville, Ky.
BLACK, G. V.....Jacksonville, Ill.
*BRACKETT, C. A.....113 Thames St., Newport, R. I.

*COLTON, A.....Hudson, N. Y.
CUSHING, GEO. H.....174 State St., Chicago, Ill.
CROUSE, J. N.....734 Michigan Ave., Chicago, Ill.
*CHAIM, M. L.....30 Cooper Institute, New York.
CHASE, H. S.....2635 Washington Av., St. Louis, Mo.
CHAPMAN, A. S.....Princeton, Ill.
CLANCEY, D. W.....Cincinnati, O.
CAMPBELL, JOHN.....Bloomington, Ill.
COOK, C. D.....133 Pacific St., Brooklyn, N. Y.
CHITTENDEN, C. C.....Madison, Wis.
CUMMINGS, W. G.....Sturgis, Mich.
CLAPP, J. L.....157 Clark St., Chicago, Ill.
CASSIDY, J. S.....Covington, Ky.
*CANINE, J. F.....170 5th Avenue. Louisville, Ky.

DEAN, M. S.....174 State St., Chicago, Ill.
DAVIS, K. B.....Springfield, Ill.
DYER, W. C.....1135 Wabash Ave., Chicago, Ill.
DRIGGS, STODDARD.....Lexington, Ky.
DENISE, O. H.....Burlington, Iowa.
*DABOLL, G. C.....Buffalo, N. Y.
*DUNN, C. E.....Louisville, Ky.
*DOYLE, OSCAR B.....Louisville, Ky.

*ESSIG, C. J.....1533 Locust St., Philadelphia.
ESSIG, IRA J.....1533 Locust St., Philadelphia.

FILLEBROWN, THOS.....Portland, Maine.
FRIEDRICHS, GEO. J.....155 St. Charles St., New Orleans, La.
FREEMAN, A. W.....675 Wabash Ave., Chicago, Ill.
FIELD, GEO. L.....Detroit, Mich.
FREEMAN, D. B.....16 Aberdeen St., Chicago, Ill.
*FARRAR, J. N.....103 So. Oxford St., Brooklyn, N. Y.
*FREEMAN, S. A.....416 Main St., Buffalo. N. Y.
FISHER, HENRY.....St. Louis, Mo.
FREEMAN, R. R.....Nashville, Tenn.
*FLAGG, J. FOSTER.....106 N. 11th St., Philadelphia.

GODDARD, W. H.....157 W. Chestnut St., Louisville, Ky.
*GAYLORD, E. S.....New Haven, Conn.
GARDINER, F. H.....142 Dearborn St., Chicago, Ill.

*HILL, J. S.....Gettysburg, Pa.
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*HOOPER, J.....Owenton, Ky.

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*KELLY, R. E.....Ashtabula, O.
KEELY, G. W.....Oxford, O.
KEELY, C. J.....Oxford, O.
KIDD, J. B.....Lexington, Ky.
KULP, W. O.....Davenport, Iowa.
KOCH, C. R. E.....67 Washington St., Chicago, Ill.
KITCHEN, C. A.....Rockford, Ill.
KEITH, H. H.....615 Olive St., St. Louis. Mo.

LATHROP, JOSEPH.....152 Woodward Ave., Detroit, Mich.

*MCMILLAN J. T.....Paris, Ky.
MARRINER, J. FRANK.....Ottawa, Ill.
MORGAN, W. H.....Nashville, Tenn.
MANSFIELD, H. A.....Evanston, Ill.
MC DONALD, G. B.....Conneautsville, Pa.
*MC KELLOPS, H. J.....615 Olive St., St. Louis, Mo.
MOORES, W. S.....Maysville, Ky.
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*NORTHROP, A. L.....44 W. 46th St., New York.

OSMOND, E.....Cincinnati, O.
ODELL, F. M.....18 W. 11th St., New York.

*PALMER, S. B. .....Syracuse, New York.
PALMER, EDGAR.....La Crosse, Wisconsin.
PRUYNE, CHARLES P.....70 Dearborn St., Chicago, Illinois.
PALMER, CORYDON.....102 W. 38th St., New York.
*PEIRCE, C. N.....501 N. 7th St.; Philadelphia, Penn.

REHWINKEL, F. H.....Chillicothe, Ohio.
RAWLS, A. O.....Lexington, Kentucky.
RIX, JOHN.....Fort Madison, Iowa.
RATHBUN, R. S. .....Lyons, Iowa.

SMITH, H. A.....286 Race St., Cincinnati, Ohio.
*SAGE, H. L... .....Bridgeport, Conn.
*STOCKTON, C. S..... Newark, New Jersey.
SHEPARD, L. D.....100 Boylston St., Boston, Mass.
STONE, E. C..... ...Galesburg, Ill.
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SPALDING, C. W.....St. Louis, Mo.
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SWARTLEY, J. S.....749 Michigan Ave., Chicago, Ill.
SHRIVER, F. M.....Glenwood, Iowa.
SMITH, P. T.....Burlington, Iowa.
SMITH, JOSHUA.....1046 Indiana Ave., Chicago, Ill.
SOUTHWICK, A. P.....Buffalo, N. Y.
SWASEY, J. A..... .....1124 Michigan Ave., Chicago, Ill.
*SMITH, D. D.....1417 Walnut St., Philadelphia.

TAFT, J.....117 W. 4th Street, Cincinnati, O.
THOMAS, GEORGE R.....Detroit, Mich.
TALBOT, E. S.....238 N. Clark Street, Chicago, Ill.
TAFT, WM.....117 W. 4th Street, Cincinnati, O.

WEBB, M. H..... .....Lancaster, Pa.
WATERS, G. F.....8 Beacon Street, Boston, Mass.
WILLIAMS, JACOB L.....6 Mt. Vernon St., Boston, Mass.
WELLS, MERRITT.....Indianapolis, Indiana.

WILSON, I. P.....Burlington, Iowa.
WATLING, J. A.....Ypsilanti, Michigan.
*WHEELER, C. F.....Albany, New York.

The reading of the minutes of the last session being called for, was then proceeded with, but upon motion the further reading was dispensed with.

The local committee of arrangements, by its chairman, Dr. Dean, made the following report, which upon motion was accepted and adopted, together with the accompanying printed programme.

Your local committee respectfully submit the following report:

After examining the assembly rooms in this city both public and private, we concluded that the one you now occupy was the best adapted to the comfort and the wants of the association. The use of this and the adjacent committee rooms, have been generously donated by the proprietor, Mr. Drake.

You have all been apprised of the special rates offered by the leading hotels in this place and are, doubtless, comfortably and satisfactorily provided for.

We have prepared a programme and order of business which have been approved by the executive committee, and which, we think, if adopted will prevent confusion and loss of time to the association.

Provision has been made for a microscopical exhibition, Wednesday, from 8 to 10 in the morning. This will take only thirty minutes out of the regular order of business, and those particularly interested in histology will have opportunities for examining specimens at such times as may suit the convenience of the committee on histology, without interfering with the regular business.

It will be observed that no provision has been made for clinics. Your committee have observed that this feature in our association has lessened in interest from year to year, while the feeling has been continually growing stronger among the members that it should be abolished by our national association and that such instruction should be left to the state and local societies. For some years after the organization of this body this practical teaching was essential, but the various state and local societies which have been organized throughout the country have, by assuming this work, rendered this feature in our association non-essential and unadvisable.

Provision has been made for two evening sessions,—Wednesday for regular business and Thursday for the election of officers, etc.

Your local committee would like nothing better than to give wing to our eloquence in a regular address of welcome, but we know you will *most*

cheerfully excuse us;—besides, we are not willing to set this example lest it should be taken as a *precedent* and we in turn might have to submit to a like ordeal by our successors.

That you are all welcome, we hope our acts during your stay with us will prove.

M. S. DEAN, Chairman.

Dr. Shepard moved the adoption of the following resolution:

Resolved, That dentists not resident in the United States who may be present, and whose names may be approved by the executive committee, are hereby invited to seats upon the floor, and to participate in the discussions.

Dr. Atkinson moved to amend so as to include physicians, and the resolution as amended was carried.

The committee on credentials made a partial report, which as finally completed by various supplementary reports, was accepted and adopted as follows:

American Academy of Dental Science—Jacob L. Williams.

Chicago Dental Society—H. A. Mansfield, C. P. Pruyne, G. W. Nichols, Edward Noyes, D. B. Freeman, Joshua Smith.

First District Dental Society of the State of New York—W. H. Atkinson.

Dental School of Harvard University—L. D. Shepard.

Dental College of the University of Michigan—J. A. Watling.

Dental Society of the State of New York—A. P. Southwick.

Indiana State Dental Association- T. S. Hacket.

Illinois State Dental Society—M. F. Hand, E. C. Stone, K. B. Davis, J. M. Hurtt, A.S. Chapman, S. M. Sturgiss, John Campbell, Frank H. Gardiner, C. R. E. Koch, T. W.Brophy, C. A. Kitchen, E. S. Talbot, G. V. Black, C. F. Matteson, R. H. Antes, J. L. Clapp.

Iowa State Dental Society—F. M. Shriver, I. P. Wilson, John Rix, L. C. Ingersoll, P. T. Smith, J. K. Brewster, R. S. Rathbun, O. H. Denise, J. B. Morgan.

Kentucky State Dental Association—John B. Kidd, Stoddard Driggs. William H. Goddard, A. O. Rawls.

Maine Dental Society—Thos. Fillebrown.

Missouri State Dental Association.—J. C. Mc Coy.

Missouri Dental College—Homer Judd.

Michigan Dental Association—J. A. Harris, H. H. Jackson, J. Lathrop, D. C. Hawxhurst.

Mississippi Valley Dental Association—Charles J. Keely, W. S. Howe, William Taft.

New Orleans Dental Association—George J. Friedrichs.

Nashville Dental Association—R. R. Freeman.
Pennsylvania State Dental Society—M. H. Webb, J. B. McDonald.
Philadelphia Dental College—J. H. McQuillen.
Pennsylvania College of Dental Surgery—G. T. Barker.
St. Louis Dental Society—J. W. Hall, H. H. Keith, Henry Fisher.
Western College of Dental Surgons—C. W. Spalding.
Wisconsin State Dental Society—Edgar Palmer.

Respectfully submitted,

L. D. SHEPARD,
J. N. CROUSE, } *Committee.*
M. H. WEBB,

The report of the publication committee was then called for, and was read by the chairman, as follows:

The publication committee have to report that they have had published 500 copies of the transactions of 1876 in the ordinary form, about 175 of which have been distributed in the usual manner to those entitled to them, and the balance remain on hand. The amount expended by your committee for this and other purposes, is as follows:

Printing Transactions as per bills		$388 00
Wrappers for mailing		80
Postage		16 33
Express, etc		3 50
Exchange		25
Printing Postals		1 75
Printing Blanks for Treasurer		12 00
		422 63
By Cash from Treasurer	$300 00	
Balance due Committee	122 63	
		$422 63

Your committee feel much chagrined at the late day at which the transactions were finally issued from the press. In explanation of the same they have to say that the cause was entirely beyond their control. They contracted (through their chairman,) for a stenographic report of the discussions, which was to be furnished within a month from the adjournment, and it was the intention to issue the volume especially early during the fall of last year, as it was known by the chairman that he would be so situated during the winter as to be unable to get the work done. The stenographer however failed to furnish the report as agreed, and did not do so until the latter part of December, at which time and for some months subsequently, the personal affairs of the chairman were such that it was impossible for him to begin the work until the middle of April, since which time it has been urged forward with all possible dispatch, but the very large amount of matter and the unusual number of authors, to whom proofs must be sent, have consumed the time in spite of every effort, until the latter part of July.

The amount of matter as above intimated, is very large; one-half at least greater than the average. The book is printed in brevier, a small sized type, and even in that comprises 232 pages of matter. Had it been printed in the style of previous years it would have made 25 per cent. additional. The increase is no doubt owing to the fact that as it was the centennial year meeting of this body an unusual number of members of committees made individual reports, and several of them were of extreme length.

The cost of the volume, considering the amount of matter has been very reasonable, being about 80 cents per copy. Your committee deemed it advisable to have a somewhat larger number than usual issued, that all desiring copies might be supplied, as no doubt many will wish to preserve the centennial record of this association,—and they recommend that they be offered for sale by advertisement or otherwise.

C. STODDARD SMITH, Chairman.

The report was accepted and adopted.

The report of the special committee on sections, appointed last year was then read by the chairman, Dr. Atkinson, as follows:

To the American Dental Association:—Your committee, in obedience to your instructions to consider the subject of forming this Association into permanent sections, and to lay before you the result of that consideration, respectfully report, that they have been strongly impressed with the importance and indeed the necessity, in order to execute properly our mission, of applying to every subject within the scope of our investigation and research, the suggestion of Dr. J. Foster Flagg with reference to one—Pathology.—that is the constitution of permanent sections, to be the analogues of the committees hitherto appointed to prepare and present papers to this body.

The principle of division of labor and concentration of effort, so extensively adopted in the successful prosecution of ends in so many business interests, and that have been so happily practicalized in this body, would seem to apply with peculiar force to our investigations and researches, since we have before us a field so wide, and embracing so many branches of science, that no one man can hope to master them all or even a considerable number of them and at the same time pursue the practice of his profession.

It can therefore hardly be doubted that the members of this association can accomplish more for the advancement of the interests of our profession by persistently pursuing scientific inquiries, as connected therewith, in a single direction or on a limited number of subjects than by the present system of preparing papers or essays year after year, and each year on different subjects.

Holding these views your committee present for your action the following resolutions:

Resolved, That the membership of this association be and is hereby divided into.....permanent sections, each section to be composed of such members as may elect to unite and form that section.

Resolved, That it shall be the duty of each member of this association to connect himself with some one of these sections, but that he shall be free to follow his own preferences as to the particular channel in which he will labor and may if he so desires be a member of two or more sections.

Resolved, That the members of each section shall at some time during each annual meeting of the association, elect a chairman and such other officers of the section as they may see fit, whose duty it shall be to see that the labors of the section are conducted in the manner calculated to secure the best results.

Resolved, That each section shall have charge of one of the subjects or branches essential to scientific dentistry, and through its chairman or such other member as it may select, report upon the same to the association at each annual meeting.

Resolved, That after the several sections shall have been fully organized and in working condition, it shall be the duty of each chairman to furnish the latest and best information in the possession of his section upon any point connected with its subject, to any member of another section who through the chairman of his own section may apply to him for such information.

Your committee have omitted the division and nomination of the subjects or branches essential to scientific dentistry. Should this report be adopted they can be easily named.

The number of permanent sections is left blank, as that must correspond to the number of subjects or branches determined upon.

Respectfully submitted,

R. FINLEY HUNT,
W. H. MORGAN, } *Committee.*
W. H. ATKINSON,

On motion of Dr. Barker, the report was accepted. Dr. Taft moved to lay it upon the table until Wednesday afternoon, which motion was on motion of Dr. Spalding amended so as to read Thursday, at 10 o'clock A. M. and the motion as amended was carried.

The Secretary then read a letter from the officers of the Board of Trade, inviting the members to visit that institution, and the invitation was accepted and thanks tendered therefor.

The Executive Committee reported H. H. Winne, D. D. S., of Shanghai, China, as entitled to the privileges of the floor under the resolution of invitation to visiting dentists.

On motion of Dr. Shepard, the reports of Standing Committees were then taken up, and the Committee on Physiology was called. The chairman Dr. Dean, read letters from the other members of the committee, Dr. Winder of Baltimore, who was detained by military duty, and Dr. Farrar of Brooklyn, which latter was accompanied by a report or paper. Dr. Dean then read his report as chairman of the Committee on Physiology.

Discussion followed, which was participated in by Drs. Atkinson, Chase, and Waters.

Dr. Taft moved that the privileges of the floor be extended to Dr. Abram Robertson, formerly of Wheeling. Va., but now of New Hampshire, from whose eyes the light of day had been shut out for eight years. Carried.

The discussion on Dr. Dean's paper was then resumed, and remarks were made by Drs. Robertson, Barker, Atkinson. Judd, Waters, Spalding, and McQuillen, after which the meeting adjourned.

FIRST DAY — AFTERNOON SESSION.

The meeting was called to order pursuant to adjournment, by the President. The minutes of the morning session were read and approved.

The subject of physiology was resumed, and the reading of a paper by Dr. Farrar on "North Light versus Sun Light," was postponed until the next morning.

The consideration of the subject was postponed, and Pathology and Surgery was called, but upon motion the vote by which this was done was reconsidered, and Dr. Ingersoll of Iowa, read a volunteer paper entitled "Is the Dental Pulp essential to the integrity of the Tooth Structure?"

The paper was then discussed, by Drs. Rawls, Barker, Sturgiss, Robertson, Ingersoll, Allport, Jno. Allen, Atkinson, Crouse, Rehwinkel, Morgan, Noyes, and McDonald, after which the meeting adjourned.

SECOND DAY—MORNING SESSION.

The meeting was called to order at 10 o'clock by the President. The minutes of the last session were read and approved.

Miscellaneous business being in order the report of the Treasurer was read, accepted and adopted, as follows:

Wm. H. Goddard, in account with American Dental Association, 1876.

1876.		
Aug 1, To balance account last year	$ 175 00	
" cash received for dues during year	715 00	
Cr.		
By paid telegram to Europe		$ 15 72
" " Janitor		25 00
" " Secretary's salary		100 00
" " Treasurer's "		100 00
" " Chairman Publishing Committee		340 64
" " Dues refunded		5 00
" " Express ch'gs, cards, paper and stamps, etc.		15 00
		601 36
Balance this day August 7th		288 64
	$890 00	$890 00

Chicago, Ills., August 7, 1877. WM H. GODDARD, Treasurer.

We have examined the report of the Treasurer and find it correct.

L. D. SHEPARD,
M. H. WEBB,
J. N. CROUSE. } *Committee.*

Chicago, Ills., August 9. 1877.

On motion of Dr. Barker, the paper of Dr. Farrar on Physiology laid over from yesterday was taken up and read by the Secretary. The paper was then discussed by Drs. McQuillen, Spalding, Waters, Rehwinkel, Thomas, Barker, Kulp, Edgar Palmer, A. W. Freeman, Atkinson, R. R. Freeman, Noyes, and Judd, after which the subject was passed.

Dr Spalding moved an adjournment to accept the invitation to visit the Board of Trade. Carried, and the meeting adjourned.

SECOND DAY—AFTERNOON SESSION.

The meeting was called to order at 3 o'clock by the President. The minutes of the morning session were read and approved.

Dr. Rehwinkel called attention to Dr. Adolph Peterman's Almanac of Dentists in the German Empire, in connection with lists of graduates of Dental Colleges, and other useful compilations. It was moved that in consideration of the labors expended in the preparation of this book, Dr. Adolph Peterman, of Frankfort-on-the-Maine, and Dr. Geo. Von Langstorf of Freiburg, Baden, be elected Honorary Members of the Association, and upon the ballot being taken they were unanimously elected. The Corresponding Secretary was instructed to notify them of the action taken and the reasons therefor.

A congratulatory telegram from the 4th District Dental Society of New York, in session at Saratoga was read by the Secretary, and on motion the President and Secretary were instructed to answer the same.

The Committee on Credentials made a further report.

The subject of Pathology and Surgery was called, and Dr. Rehwinkel read a paper entitled "Pyorrhœa alveolaris," which was discussed by Drs. Rawls, Shepard, Corydon Palmer, Barker, Atkinson, McQuillen, Rehwinkel, and Judd, after which the meeting adjourned.

SECOND DAY—EVENING SESSION.

The Association was called to order at 8 o'clock P. M. by the President. The minutes of the previous session were read and approved.

Under the head of miscellaneous business Dr. Allen offered the following resolution, which after some debate was indefinitely postponed:

Be it Resolved, That a Committee of three be appointed by the chair, to revise and amend such portions of our present Code of Dental Ethics as do not harmonize with each other, and report the same at our next annual meeting.

On motion, Dr. Edgar Palmer read a volunteer paper entitled "The Potency of Alcohol to cause Dengeneracy of the Human Teeth," which was discussed by Dr. Atkinson and the subject was passed.

The subject of Histology and Microscopy was called for, but there were no reports and the subject was passed after a few remarks by Dr. McQuillen.

The subject of Chemistry was taken up, and a report written by Dr. J. S. Cassidy was read by Dr. Taft, after which the meeting adjourned.

THIRD DAY — MORNING SESSION.

The meeting was called to order by the President. The minutes of the preceeding session were read and approved.

The Special Order was the report of the Committee on Sections, which was called up by the President at the hour named. The report was read and discussion ensued.

Dr. Barker moved that the report be recommitted and three new members added to the Committee. Carried.

On motion, the vote to recommit was reconsidered and the discussion was renewed.

Dr. Spalding moved to increase the number of the Committee to ten, and to instruct the Publication Committee to print and distribute the report as it stands.

Dr. Shepard moved that the final report of the Committee should be printed and distributed to members, at least one month previous to the next meeting.

Dr. Barker accepted Dr. Shepard's amendment.

A division of the question being called for, the question was put on the motion to increase the Committee from three to ten members, which motion was carried.

The previous question was then ordered and the motion as amended and reduced to writing, was put and carried, as follows:

Resolved, That the Committee be increased to ten members, and that the report presented by the Committee of three be recommitted to said Com-

mittee for amendment or reconsideration, and that they be instructed to print the results of their deliberations and that a copy be mailed to each member of the Association, at least one month before the next annual meeting.

So the report was recommitted to an enlarged Committee of ten, who were appointed by the Chair subsequently, but are for convenience inserted in this place, as follows:

Drs. R. Finley Hunt, W. H. Atkinson, and W. H. Morgan, (original committee); C. W. Spalding, St. Louis; H. Judd, St. Louis; H. A. Smith, Cincinnati; G. T. Barker, Philadelphia; J. H. McQuillen, Philadelphia; J. N. Crouse, Chicago; L. D. Shepard, Boston.

The subject of Chemistry was then taken up, and Dr. Taft read a report written by Dr. Essig, which was discussed by Drs. Osmond, Noel, Judd, and Fredericks, when the subject was passed.

The Committee on Therapeutics was called, and Dr. Shepard read a report by Dr. Brackett on that subj ct, after which the meeting adjourned.

THIRD DAY—AFTERNOON SESSION.

The meeting was called to order at 2:30 P. M., the president in the chair. The minutes of the preceding session were read and approved.

The Committee on Credentials made a supplementary report.

The Executive Committee reported that they had filled certain vacancies in their Committee by placing Dr. Fillebrown upon the 1st Division, transferring Dr. Cushing to the 3d Division, and adding Drs. Judd and Bogue to the same.

The subject of Therapeutics was resumed and Dr. Odell read the report of the Committee, which was discussed by Drs. Atkinson, Judd, Rehwinkel, Nichols and Barker, after which the subject was passed.

The Committee on Operative Dentistry was called, and a report was read by Dr. Cushing, the Chairman, which was followed by one by Dr. Harlan, after which the subject was discussed by Drs. Rawls, Howe, and Webb, and the meeting adjourned.

THIRD DAY—EVENING SESSION.

The meeting was called to order by the President at the usual hour. The minutes of the morning session were read and approved.

Miscellaneous business was called up, and Dr. Taft offered the following Amendment to the Constitution :

Change Art. III, Sec. 4, so as to read : "All delegates shall be practitioners of dentistry; they shall receive their appointment only from permanently organized *State* Dental Societies and Dental Colleges," etc.

Dr. Keely offered the following Amendment to the Constitution :

Change Art. III, Sec. 1, so as to read, "Each local Society may send one (delegate) for every *fifteen* of its active members," etc.

[The words in italics are those in which changes are made.---SEC.]

Both of these proposed Amendments were laid over until next year, according to the Constitution.

The following resolutions were adopted :

Resolved, That the Treasurer be and is hereby instructed to notify all permanent members of the amount of their arrears, as early as convenient after the close of each session. (Standing resolution.)

Resolved, That the salaries of the Secretary and Treasurer be paid.

Dr. Taft moved that a Committee of three on the Nomenclature and Terminology used by the dental profession, be appointed, to report at the next meeting. Carried, and Drs. Taft, Atkinson and Judd were appointed as such Committee.

The Special Order, the election of officers, was then taken up and proceeded with, with the following result.

President—F. H. REHWINKEL, Chillicothe, Ohio.
First Vice-President—L. D. SHEPARD, Boston, Mass.
Second Vice-President—GEORGE T. BARKER, Philadelphia, Pa.
Corresponding Secretary—M. H. WEBB, Lancaster, Pa.

Recording Secretary—M. S. DEAN, Chicago, Ill.

Treasurer—W. H. GODDARD, Louisville, Ky.

Executive Committee—[New Members,] DRS. H. JUDD, W. H. MORGAN AND THOS. FILLEBROWN.

The Society then proceeded to ballot for the place of next meeting, and upon the first ballot Niagara was selected.

The meeting then adjourned.

FOURTH DAY—MORNING SESSION.

The meeting was called to order at the usual hour, the President in the chair. The minutes of the preceding session were read and approved.

Dr. Dean proposed the names of the following gentlemen as honorary members, and upon the ballot being taken, they were unanimously elected:

J. Smith Turner, M. R. C. S., Chas. S. Tomes, M. A., M. R. C. S., John Tomes, F. R. S., M. R. C. S., all of London. E. Magitot, M. D., Mordaunt Stevens, M. D., D. D. S., M. R. C. S., Paris. Fr. Wedl, Vienna.

Dr. Hawxhurst offered the following Amendment to the Constitution:

Add to the first clause of Sec. 4, Art. III, the following: "No Dental College shall be eligible to representation in this Association which does not require two courses of lectures as a condition of graduation."

Laid over for one year.

Dr. Taft spoke to a question of privilege, and in the same connection Dr. Allport offered the following resolution, which was unanimously adopted:

Resolved, That this Association fully endorses the action of its Treasurer, Dr. W. H. Goddard, in exacting dues of all members before allowing them to take part in the proceedings, as in so doing he is only carrying out the law.

Dr. Edgar Palmer offered a resolution providing that to prevent time being taken up by volunteer papers, no such paper should hereafter be read

until all the reports of Standing Committees shall have been presented and discussed. Lost.

Dr. Kulp tendered the thanks of Dr. Winne of China, for the courtesies extended to him.

The regular order was then proceeded with, and the subject of Operative Dentistry was taken up, and remarks were made by Dr. Corydon Palmer.

On motion of Dr. McQuillen, the time of speakers was limited to five minutes, except by unanimous consent.

The discussion on Operative Dentistry was then resumed and was participated in by Drs. Hall, Waters, Taft, Thomas, McDonald, Barker, Rawls, Atkinson, Ingersoll, Allport, and John Allen, after which the subject was passed.

The subject of Mechanical Dentistry was called for, and the Secretary read a brief letter from Dr. Morrison on the subject, which was then passed.

The subject of Dental Education was then taken up, and a report was read by Dr. Fillebrown, a member of the committee, which closed with a preamble and resolutions, which the author desired to put to a vote after the subject should have been discussed.

[These resolutions were laid on the table till a later period and were then voted upon, and will be found on page 27.—Sec.]

Dr. Crouse then read a report on the same subject, after which the meeting adjourned till 2:30 P. M.

FOURTH DAY—AFTERNOON SESSION.

The meeting was called to order at the appointed hour, the President in the chair. The minutes of the morning session were read and approved.

Dr. Shepard offered the following resolutions, which were adopted :

Resolved, That the Treasurer be authorized to pay the drafts of the Publication Committee as required.

Resolved, That the American Dental Association tender their thanks to J. B. Drake & Co., proprietors of the Grand Pacific Hotel, Chicago, for

their liberality in furnishing to the Association the excellent assembly room in which the meetings have been held, together with stationery, attendance etc., free of expense to the Association.

Resolved, That it is the opinion of this Association that the Grand Pacific Hotel stands eminent for liberality and skillful management.

Resolved, That the thanks of this Association be tendered to the proprietors of the Palmer, Sherman, Clifton, Matteson and Tremont Houses, for a liberal reduction in rates.

On motion it was voted to suspend the rules at the close of miscéllaneous business, to hear the report of the Committee on Credentials.

The Committee on Nominations made their report, which on motion was accepted and adopted as follows:

	PHYSIOLOGY.	
M. S. Dean,	J. H. McQuillen,	C. W. Spalding.
	PATHOLOGY.	
W. H. Atkinson,	G. R. Thomas,	D. C. Hawxhurst.
	HISTOLOGY AND MICROSCOPY.	
G. V. Black,	G. F. Waters,	C. N. Peirce.
	CHEMISTRY.	
T. L. Buckingham,	L. G. Noel,	W. A. Bronson.
	THERAPEUTICS.	
F. M. Odell,	L. C. Ingersoll,	C. C. Chittenden.
	OPERATIVE DENTISTRY.	
H. A. Smith,	L. D. Shepard,	M. H. Webb.
	MECHANICAL DENTISTRY.	
A. L. Northrop,	H. H. Keith,	W. N. Morrison.
	EDUCATION.	
J. N. Crouse,	Thos. Fillebrown,	Geo. J. Friedrichs.
	LITERATURE.	
C. D. Cook.	A. H. Brockway,	W. H. Morgan.
	ETIOLOGY.	
D. C. Hawxhurst,	D. W. Clancy,	J. Frank Marriner.
	PRIZE ESSAYS.	
H. Judd.	W. W. Allport,	C. S. Stockton.

The Committee on Instruments and Appliances made their report, which was read by Dr. Brockway, and was accepted and adopted.

The subject of Dental Education was then resumed and remarks were made by Drs. Atkinson, Taft, Spalding, Barker, Judd, Black, Osmond, McQuillen, Shepard, and Fillebrown.

[The meeting here took a recess for the purpose of adjourning from the Assembly Room to a smaller room in another part of the building.]

On reassembling, Dr. Judd offered the report of the Committee on Popular Education, appointed some years since, the same being a printed pamphlet prepared by a similar committee of the Illinois State Dental Society. The report was accepted and laid over for consideration at the next annual meeting.

The discussion upon Dental Education was resumed, and remarks were made by Drs. Crouse and Spalding.

The rules were then suspended in order to vote upon Dr. Fillebrown's resolutions, which were as follows:

WHEREAS, Dentistry is a specialty of the science of medicine:

Resolved, That we esteem a sound and thorough medical education essential for the most successful practice of it.

Resolved, That we deem it expedient for the best interests of the profession of dentistry, that existing medical schools enlarge their courses so as to include efficient instruction in dentistry, in order that it may be placed on an equality with other specialties of medicine.

A division of the question being called for, the preamble and the first resolution were put to vote and carried. The second resolution was lost. The subject of Dental Education was then passed.

The subject of Dental Literature was then called for, and Dr. Shepard read the report of the committee.

The subject of Etiology being called up, Dr. Hawxhurst, Chairman, and Dr. Webb, a member, of that committee, each read a report, and the latter was adopted and endorsed.

Dr. Barker declined the Chairmanship of the Committee on Etiology, and on motion Dr. Hawxhurst was substituted.

The Committee on Prize Essays made a report, which was read by Dr. Morgan, and was accepted and adopted.

The following resolutions were adopted:

Resolved, That the thanks of the Association are hereby tendered to the profession of Chicago and the Chicago Dental Society for courtesies received.

Resolved, That the thanks of the Association be tendered to the retiring officers for the manner in which they have discharged their duties.

Dr. Atkinson moved to substitute Dr. Barker in place of Dr. John Allen, (who declined,) on the Committee on Sections. Carried.

The President appointed as the Local Committee of Arrangements for the next session, Dr. G. C. Daboll, Buffalo; G. L. Field, Detroit; and C. R. Butler, Cleveland. Also as members of the Publication Committee, Drs. G. H. Cushing and H. Judd.

The newly elected President was then conducted to the Chair and introduced, and the retiring and incoming Presidents each made a few appropriate remarks, after which the Association was declared adjourned, to meet at Niagara Falls, on the first Tuesday in August, 1878.

REPORTS

OF

STANDING COMMITTEES,

VOLUNTEER ESSAYS

AND

DISCUSSIONS.

REPORT

OF THE COMMITTEE ON

DENTAL PHYSIOLOGY.

By M. S. DEAN, Chairman.

Since the able report of last year, no new facts have come to the surface, nor have any new publications bearing upon the subject of Dental Physiology been brought to our notice. The recent work by Mr. C S. Tomes, "A Manual of Dental Anatomy, Human and Comparative," is the latest issue that contains any new and valuable researches in connection with this subject, and this was partially reviewed by myself at our last meeting. Since that time I have carefully perused this work, and I find that its value was by no means over-rated.

In accordance with a resolution adopted by this body, each member of your committee will report independently, and upon such branches of the subject as may suit his inclination or taste.

I shall then, occupy the brief time allotted to me, in discussing a few disputed points in physiology, and in doing this I may be drawn over the feeble line that separates it from the domain of pathology. If so I shall not shield myself behind the definition of Beale, who declares Pathology to be the "Physiology of disease," but shall claim my right to search *in whatever field* of science I please, for facts which may throw light upon the physiological principles under discussion.

As a sort of ground-work, then, for what may follow, and for the purpose of refreshing our memories, I will submit a few generally recognized facts without argument:

1. That the dentine is either formed by the direct calcification of the odontoblasts, or, is the product of a secretion of these cells. In either case it is the result of the odontoblasts. 2. That after the dentine has been developed, these cells, with one of their processes extending into and filling the dentinal tubes, are arranged in contact with each other upon the internal surface of the dentine, and form what was until recently supposed to be, the *membrana eboris*. 3. The odontoblast cells having accomplished this work of development, their legitimate office thereafter, is to perfect it, and to preside over its nutrition. 4. The dentine having no active functions to perform, the work of these cells is now comparatively light; and, following the law of all living bodies, their size and vigor are correspondingly diminished. 5. By the stimulus of irritation these odontoblasts (like all other cells) renew their activity, and again commence the labor of building up the structure, though not always in exact accordance with the original type. 6. Inasmuch as the dentinal tubes after the development of the dentine is completed (in magnitude), always become lessened; and inasmuch as in the teeth of persons of advanced age they frequently become entirely obliterated by lime salts, it would appear that there is a natural tendency or predisposition to an increased development during the life of the pulp; and, that this predisposition is often hastened or *determined* by the stimulus of irritation from a source external to it.

These propositions will I think, be substantially accepted by all. They are important facts to be borne in mind; and they bring me to the point which I have selected for discussion, viz.:

Does vital action play any part in producing any of the Structural Changes observed in the living dentine?

In discussing this subject I shall at this time entirely avoid the inquiry, whether the *living elements* of which the dentine is composed, do not modify in some degree the chemical affinities and by their vital force shield the tissues, in a measure. from destructive influences. That they do this I attempted to show in a paper read before the Odontological Society of N. Y. some two years ago. But the question now is, whether the changes which we observe in the structure of the living dentine when attacked by decay, are due to vital manifestations of the dentinal cells?—An affirmative answer to this question seems to me so reasonable, that its discussion would seem a waste of time, had not some able writers and distinguished physiologists lately opposed this view with uncommon ability. Foremost among

these, are, I believe Leber and Rottenstein, supported by such noted names as C. S. Tomes, Prof. Wedl, and many others less illustrious.

Messrs. Leber and Rottenstein, in their work on "Dental Caries and its Causes," speaking of the calcareous salts found in the dentinal tubes, say: "These calcareous deposits in the interior of the canaliculi are considered by Messrs. Tomes and Magitot (here he means J. Tomes) as the product of a vital action. We are still more inclined to believe that these calcareous deposits are formed by a purely chemical process; that is to say, by the residue resulting from the solution of the calcareous salts by contact with acids. In the work of caries a portion of the calcareous salts of the teeth is always dissolved out; these same salts, so dissolved, must by diffusion penetrate the canals toward the cavity of the pulp; there, in contact with a neutral or alkaline liquid which fills the interior of the canals, or which penetrates the dentinal fibrils a precipitate is formed." The most we can say of this is, that it is an ingenious hypothesis but a very complicate process. In another place, these authors say: "During the action of caries there are often formed calcareous deposits in the interior of the dentinal tubes, deposits which Mr. Tomes and Mr. Magitot have regarded of great importance. They are seen ranged singly or in groups, under the form of minute threads, or bundles of them more or less long; or else under the form of separate cylindrical granulations. On submitting them to the action of acids, they dissolve and leave most frequently an *organic residue* which *preserves the same form.*"

If the former statement of these gentlemen be true — that the lime salts dissolved out by the acids, enter the tubules from the external surface of the caries, and are there precipitated, this precipitate, this deposit is merely *crude* phosphate of lime. The molecules cannot be encapsulated by organic matter; and therefore, on submitting these deposits to the action of acids they *cannot* leave an "organic residue which preserves the same form." These deposits, then, in the dentinal tubes are, according to the showing of Leber and Rottenstein as truly organic as are the secondary deposits upon the inner surface of the dentine, and are, of course, the result of *vital action.*

If the data of these authors are correct this question is already settled without additional argument.

Under the head of "*Stationary Caries*" these authors say: "The

considerations presented by Messrs. Tomes and Magitot upon the cause which determines the stationary state of caries are founded upon the presence of calcareous deposits in the minute dentinal canals." They continue: "as the formation of these calcareous deposits cannot be attributed to a *vital action*, we are led to believe they are secondary, and that they become abundant only when from some cause the action of the acid has ceased; then the calcareous salts which existed in the state of solution are precipitated. Neither do we believe that the dentine can become harder in stationary caries, excepting perhaps the surface, where mechanical means such as friction or pressure, may produce a slight condensation."

It would appear then, according to Leber and Rottenstien, that the phenomena of stationary caries are due to *friction*, *pressure*, and the *precipitation* of lime salts in the dentinal tubules after the action of acids has ceased.

If these surfaces are submitted to sufficient friction and pressure to polish and condense them, it would seem that this solution of calcareous salts would be so quickly removed by these means as to render this theory impossible. This would be especially the case on the grinding surfaces of the upper teeth and the buccal surfaces of the lower teeth, where the gravitation of these salts would rather *prevent*, than facilitate, their entrance into the dentinal tubes.

Mr. C. S. Tomes concludes his remarks on the subject of vital action, in his Appendix to A System of Dental Surgery—in these words: "From the preceding observations it will appear that, inasmuch as no characteristic appearances can be found to distinguish caries, as occurring in living, from that attacking dead teeth, it seems that the hypothesis of vital action must be abandoned *in toto*."

In arriving at this conclusion it would seem to me that Mr. Tomes has not exercised his usual care in analyzing the evidence upon which it was based. He founds his opinion upon the "*appearances*" of the zones of transparency in the living teeth as compared with the dead teeth. From his own observations, which he says have been few, "he is inclined to think that the transparent zone is as constant in the decayed human teeth, used as artificial substitutes, as in the living teeth."

Now Messrs. Leber and Rottenstein, from whom he extensively quotes

in support of this view say, *most positively* that this zone of transparency is the result of the *withdrawal* of the lime salts, and Mr. Tomes himself says, in speaking of the translucent changes, "the tissues might be rendered more transparent either by the obliteration of the canals by calcification of their contents, or by the decalcification of the matrix." And in describing the zone of transparency, he says it "corresponds, in naked-eye, and microscopical appearance, to the dentine of the roots of the teeth of old persons," etc. And then again he says, "these old roots have been shown by actual chemical analysis to be *far more rich in lime salts* than ordinary healthy dentine."

These authors seem to judge solely from the *appearance* of these tissues, without the aid of chemical analysis, that these zones in the living, and in the dead teeth a e structurally the same. How do they know this, if the dentine to which lime salts are *added* presents the same appearance as the dentine from which these salts have been *abstracted?*

We may fairly conclude then, without further argument, that the premises which these gentlemen furnish us are at least equivocal; and, that although the transparent zone in living and in dead teeth may be similar "in naked-eye, and microscopical appearance," yet there is no evidence that these zones are chemically and structurally alike, nor that vital action may not be the cause of one, while chemical action is the cause of the other.

You will bear with me, I trust a moment longer, since this point—the zone of transparency—is considered a very important one. Indeed Mr. C. S. Tomes, before bringing up his forces to attack this theory says, this "is the last remaining evidence of *supposed* vital action."

Messrs. Leber and Rottenstein, in speaking of these zones of transparency—"cones" they call them—say: "We find these cones in teeth attacked by caries at a period when the exterior surface of the enamel *has still its polish*, and consequently has *lost no portion of its substance.*" They figure such a tooth, in which the "cone" extends from the enamel nearly to the pulp.

Now how is this change in the dentinal structure, in the case cited, to be accounted for? Certainly not by the filling up of the tubes with calcareous matter entering from the external surface; for if so, from what source

is it derived? Not from a solution of the lime in the enamel or dentine; for these authors say, expressly, that "the enamel has lost no portion of its substance."

This changed appearance then must be the result of either chemical or vital action. It cannot have been produced, in this case, by the acid reagents entering the tooth-substance; for this would be a physical impossibility. Besides, even if it were possible for acids to thus penetrate the dentine, they would unite with the first affinity they met in their course, instead of traversing a calcareous structure to such a depth, and dispersing themselves over so extensive an area.

Again if this "cone" is the result of the withdrawal of calcareous salts from the matrix of the dentine, where have these salts gone? As they cannot have been dissolved out, they must have been removed — if removed at all — by absorption.

Finally, whether this "cone" was caused either by a *diminution* or by an *increase* of lime salts, this removal or deposition can be accounted for only upon the theory of *vital action*.

Thus far I have attempted only to show that the main arguments which have been advanced to refute the hypothesis of *vital action* are fallacious; and, that the facts upon which they are based, tend rather to establish than to overthrow this hypothesis.

I will now offer a few facts, and arguments, which, I think, will settle beyond a reasonable doubt, the fact that under certain circumstances, from the irritation produced by caries, and from other external causes, changes do occur within the structure of the dentine, which are due to vital action.

The first argument is so well expressed by Mr. C. S. Tomes, in presenting the *pros* and *cons* upon this subject, that I shall adopt his own words. He says: "In favor of the view that the dentinal fibrils become calcified, several arguments may be adduced; one is its *prima facie* probability. We know that slow progressive calcification does go on in the tubes long after the apparent completion of the dentine, and, seeing that the irritation of caries does unquestionably cause calcification to start afresh in the pulp, it seems very natural to suppose that it would have the same effect in dentinal tubes."

While it is doubtless true that secondary deposits are often formed upon the internal surface of the dentine in teeth when there does not appear to be any calcification of the contiguous fibrils, this fact would only prove that the irritation to which these terminal fibrils had been subjected, (which must be greater here than in remoter parts) had been so great as to overcome the resisting vital force in these cell processes, and to cause their ultimate destruction. But, when the stimulating influence has been less overpowering, but long continued, as, for example, in Stationary Caries, there are often found calcareous deposits both in the dentinal tubes and upon the internal surface of the dentine.

Now I have a single fact to present, such as I have nowhere seen mentioned in this connection, and which shows conclusively that irritation of the terminal fibres in the dentine does cause this calcification. In a case in practice, which struck me forcibly at the time, I saw some central and lateral incisors which had been extensively filed for the removal of caries when the person was 14 years of age, and 18 or 20 years before he came under my hands. I found, on examining these teeth, some slight points of decay—so slight indeed, that I felt at first doubtful as to the propriety of filling them. The patient, of his own accord often spoke of the sensitive condition in which these teeth had remained for several years after they had been thus filed. In preparing these cavities to be filled, I found the dentine of such a flinty hardness that, though I used the engine, I had great difficulty in forming them. You have all seen similar cases to this, and I mention it only because the unusual density of the dentine was here shown in a very marked degree.

Since the introduction of Dr. Arthur's method of forming spaces, and removing superficial decay, no fact has become more generally established than that the irritation produced by the removal of superficial dentine, causes the obliteration (in a greater or less degree) of the terminal dentinal tubes; and this is beyond question due to vital action, as really as are the calcareous deposits upon the inner surface of the dentine.

If the irritation caused by the use of the file, or by other mechanical means, is capable of causing the calcification of the fibrils, we must believe, in the absence of any other rational cause, that the irritation arising from caries, when found sufficient to induce calcification in that portion of the cells lying *within* the pulp cavity, might also affect in the same manner *that part* of the cells which lies *nearer* the source of irritation.

In closing this report—or essay if you please—I would offer my grateful acknowledgements to Dr. McQuillen, of Philadelphia, and Dr. Chase, of St. Louis, and also to Dr. Swain, of Chicago, who have kindly furnished me with histological specimens of rare value bearing upon this subject.

DISCUSSIONS.

DR. ATKINSON: I had hoped that a report of such importance as this would have caused the jumping to their feet of at least a dozen of the hard workers and close thinkers upon histology in this body. I wish to name some of the principles that seem to be overlooked, and also to suggest that we are laboring under great difficulty by endeavoring to wear the clothes of our histological childhood—that we are entrapped by the verbiage of this paper into thinking that chemical action is not vital action. That there is a difference we understand very well, but difference between the power that produces anything that is moved, if held different in kind, is a fallacy, and is clearly sufficient to make the conviction fasten itself upon every mind when the statement is simply made. If we know the *power* by which all the operations of the building and the taking down of all the bodies that we are acquainted with, we know that we all refer to that *energy*.

Now to make the distinction that is made in different degrees of the process of constructing bodies and of taking them down, is a great stumbling block. It is in the way of our clear comprehension of what is meant when we speak of that minor expression of vital action, which is called chemistry. In the way that is intended to be understood, I have no doubt it is perfectly true. We think we have said something very smart when we said that dentine and enamel were different tissues, and that they were operated by different powers or different energies. They both owe their production to calcification, that is to say consolidation of lime-salts. That consolidation of lime-salts, if it were free, would go on to a perfect consolidation, which would be crystalization, and anything short of that would not be exactly crystalization. But it would be consolidation in the irregular form of molecules. Reference has been made to learned gentlemen in Europe that we are very fond of following. Would to God that we followed them with our eyes open, and digested what they say, and left all that is innutritious alone, and

took all that is nutritious, going forward leaving the old work and coming to a higher thought. All bodies that we are acquainted with, originate in a uniform mass of bodies, known as "embryonal corpuscles." They ignore all the action of the osteoblasts; they take up and use the embryonal bodies, that are themselves made up of a preparation that holds lime within it so closely that there has been no chemical analysis short of incineration—short of direct burning, that has been able to make protoplasm give up its hold on the lime-salts. I refer to the calcoglobin—that is, bodies that are transparent in their character may have just such lime-salts in them, and have all the regularly arranged molecules of lime-salts held in solution of the albuminose that we call protoplasm, that circulates in the dentinal tubuli; and it makes no difference as to the weight, it is simply the arrangement. You can see that this is true of ice; when it is regularly arranged and crystalized all the way through in successive planes, with exactly the same degree of consolidation, it is perfectly transparent; but if you have the cross lines of frigirification, you find it has generally an opaque appearance. I want to emphasize this point that all the human embryonal bodies that we are aware of, have to come from a proteinaceous substance, that is, a homogeneous mass, unpronounced to any of our senses, only understood by a long and labored analysis, as being an admixture of the various elements by affinity; with simply different arrangements held within the minute mass of either normal or secondary dentine, as the case may be; and when we shall come to know more about these modes and methods, we shall stumble less and understand more clearly the different stages that are called rapid and slow caries or decay.

In the paper, caries is used to indicate some sort of an agency that has a specific duty to perform, and it operates in a certain way. It is simply the absence of the togetherness of the tooth—of that quantity of affinity that holds the parts in a normal relation to each other in the type that built it—that enables it to be remanded to what is called the domain of chemistry. There is no tooth that can stand against certain forms or modes of motion. Suppose they have stronger affinities for the elements in the tooth than the elements of the tooth have for each other? When anybody comes to court Susan a little better than Jimmie, to whom she was married, you may bet that Susan will go for him! What does this courting mean? It means the awakening of the latent energy that is in the substance from which we build any of the bodies. And as dentists, it is very fortunate that we have not to travel much out of the expression of crystalization in its various degrees when we deal with enamel and dentine. When we deal

with cement or with soft tissues—those that are called animal tissues—the work is more complicated and it is more difficult to see. But we forget that we must have the animalized basis out of which these calcific or mineralized products are produced before we could have these affinities awakened so that they could arrange themselves in the enamel rods and in the dentinal interspaces, leaving an uncalcified track that still continued to circulate the protoplasm, the nutrient material that holds lime salts together and has been known to break up into globular masses in consequence of the very substance that is here referred to (calcoglobin,) as making the clear zones or cones in the tooth with those that are less transparent and that depend upon the awakening of certain affinities in the atoms that constitute the molecular mass out of which the tissue is built.

We are talking very fine things when we are talking about the bonds of affinity, the power to unite atoms. If we had a whole month to discuss this question, and could have specimens before us, we would begin to be able to comprehend something about it, and we would then know why it is when we cut out a decayed place and fill it with some indestructable material or some substance that is not capable of being dissolved, and that would not destroy the life of the tissue, we would succeed in saving the tooth; and this knowledge lies at the foundation of our ability to diagnose what that ought to be. The reader of the report said he was in doubt whether he ought to attempt to fill the tooth, and when he came to excavate he found it—did he say "harder than enamel?" If he did not, I can tell him *I have*, repeatedly, and I presume if it were weighed it would have been found to have greater specific gravity.

Dr. Chase: Any one that has made a large number of microscopic specimens knows very well that the more dense the dentine is, the more it is calcified, the easier the edges of the specimens break away; and that is the reason why it is so hard to make specimens of enamel for the microscope; and if you have a specimen that is very highly calcified you will find the edge very ragged, having projections and indentations, in and out; but if you have specimens from a young tooth not highly calcified, the edges of your specimen as you work it down on the stone will be uniform, because it does not break away like glass, as it does when highly calcified; and, by the way, it looks like glass in making these specimens: I have observed a great many times where there has been decay, that there has been a hyaline appearance in the vicinity of the cavity, indicating a higher calcification of the dentinal tubes, as they run directly to the pulp; some-

times only on one side, and sometimes both sides. Invariably where I find this appearance I find a ragged appearance of the specimen, showing that it is highly calcified, and that is one way that I can tell whether a specimen is highly calcified or not—by the way it rubs down.

The author of the paper is correct when he says that vital action has a great deal to do with hardening the tissue to obstruct the progress of decay. I am sure that I have specimens, if I have not given them away, showing decisively a vital change *within* the dentine, among the dentinal tubes, where absorption was taking place from the *outside*. A year or two ago in the *Missouri Dental Journal* was engraved a specimen showing a conversion or change of dentinal tubes back into its original cells; a regular cellular structure mixed up with dentinal tubes undergoing metamorphosis.

DR. WATERS: I can confirm the statement of the last speaker in regard to the friability of the hard parts of the tooth and, also, the statement that has been made in regard to density or hardness of those parts that have been subjected to friction. One tooth I operated upon was from my own mouth, and I know something about the service that it has rendered me and the labor that has been thrown upon it. In that case an adjacent tooth was extracted some years ago and disclosed a discolored spot on the enamel. That spot at the time of the extraction of the first tooth was somewhat soft, but dark; the surface of the enamel appeared, however, to be continuous. The first tooth extracted was a bicuspid, the second a molar. Upon extracting the molar I made three sections through the crown. The first section, which included the whole crown and down through the buccal roots, had an unusual appearance in the roots, the crown itself showing radiation of the tubuli, but the roots showing no tubuli, whatever, and having merely a clear, honey-like appearance. There was an obliteration of all appearance of tubes. The second section, which passed through the discolored spot, when subjected to a twenty-fifth, also showed places dissolved away in the substance of the enamel, and quite a space between the enamel and the dentine, the dentine having evidently shrunk, and showing much more discoloration than the enamel; but the enamel itself was in this case very friable. The dentinal tubes were mainly obliterated— towards the pulp there were some traces of them. The third section, made through a dark point or rather enclosing a dark point on the palatal surface of the crown, presented an appearance unlike anything that I have ever seen. In the surface where the edges of the enamel dipped towards this little dark point, a fifth objective disclosed something which looked like a vegetable

mold, a fungoid body. The twenty fifth brought it out more distinctly and gave it the appearance which a piece of bread will give to the unassisted eye when it has laid in a fish tank for a little while, and got fungi growing upon it. The appearance was as though there were rows of small threads leading from it, and on the ends of those, little knobs, looking somewhat as the eggs of the golden-eyed lace-winged fly. She touches a limb with her ovipositor, from which she extrudes her eggs, attaches a little albumen and draws it out, and on the end of the thread leaves a little white egg; she will put down two or three dozen of these eggs in one spot. That is the appearance which these little points had when very highly magnified. On one side the appearance of Nasmyth's membrane is wanting; on the other side it was distinctly to be seen passing into the chamber of decay, which was entirely within the enamel. I found there a large number of bits, resembling some of the fungoids; some of them looked like bone-cells. They were very singular, and I have yet seen no one who has been able to determine their exact character; but, from the appearance of the enamel in the neighborhood, I suspect them to be of low vegetable origin, and that, in their development, they throw off carbonic acid. The appearance is precisely that which you see in the cavities of lime rocks, where the lime has been dissolved away by carbonic acid, and that is why I suppose them to be of vegetable origin.

Dr. Robertson: I wish to say a few words in illustration of what I regard the truth of the essay that we have heard; that is, that dentine that has vitality resists decay and forms new deposit. I wish to illustrate that by my own case. My right upper central incisor was imperfect in its formation. It was more than a year later in its development than its mate. Before half its crown was developed it proved to be decayed; black decay, extending entirely across the front of the tooth, nearly the 16th of an inch in width. The cutting edge of the enamel was perfect to the extent of nearly the 16th of an inch. Nature deposited new dentine there and filled the cavity. By long use the cutting edge has been worn off, and more than half of the new deposit of dentine, but there is enough left now for any one who wishes to examine. They will find that it is perfect, with the exception that there is a slight line where it could not unite with the enamel on the side worn away. It seems to me this is a definite and positive proof of the truth of that essay.

Dr. G. T. Barker: I desire to add my commendations of the essay as read, although dissenting from some of the conclusions. The authorities

on both sides were presented, so thus an opportunity is given to examine and weigh the arguments. Dr. Atkinson has called attention to the great fact that we must not attempt to divest chemical action from the vital action, which we see going on in the economy all through life. They are one and the same, differing not in kind, but only in degree.

I cannot fully endorse some of the remarks of Dr. Waters, in which he speaks of certain surprising phenomena, or rather, manifestations of dental histology, which he observed by means of the *twenty-fifth* objective, in the microscope. Every one who has had any experience with high power glasses, knows that we are apt to be deceived by aberrations of vision, etc., and it is necessary to receive the evidence, unless fully substantiated by other evidence, with extreme caution.

Dr. Judd: I have but a very few words to say upon this question. In regard to the paper, I think it is well written and well considered—that its points were well taken and well defended. In relation, however, to one or two points, I would say a word. It was stated in the paper that it was conceded generally that the dentinal tubuli, or the dentine, rather, was either formed by a secretion of the odontoblasts or by a deposition of calcareous matter within the odontoblasts. It seems that there are different opinions in regard to the histogenetic action in the formation of this structure. and that it has been narrowed down to these two points. I am inclined to think, from all the evidence that we have before us, that this tissue is formed by the deposition of calcareous matter within the cell; but I wish to qualify somewhat this word deposition. We have been accustomed to look upon this word as simply specifying a deposit without any action connected with what we have considered as a vital power. This is the sense in which it is generally used; and, if this is the sense in which it is used here. I shall beg leave to differ from those gentlemen who consider this deposition as entirely independent of any vital force, because I believe that to a certain extent the deposition of the earthy deposit within the cell is brought about by vital force.

In regard to the doctrine of dentine being a secretion of these odontoblasts, I will simply state that in the first place we have no evidence before us that the cells secrete at all. If we take this side of the question, we must commence with a supposition, and then we have got to build up our arguments by other suppositions, based upon the primary supposition,

which, to say the least of it, is an exceedingly loose way of reasoning. On that account I am led to reject that doctrine altogether, from what knowledge we have at the present time.

I want to say a word or two in regard to this matter of vital action and chemical action. Dr. Atkinson is always impressing upon us that there is no difference between vital action and chemical action except in degree. Now I want him to tell me the exact degree of force that is necessary to be exerted to make it a chemical action, and measure the degree of force, if he can, when it becomes a vital action. I think myself that he is not quite clear upon this subject. We are apt to get into a little deep water, all of us, in discussing these subjects. I do not think that this definition that Dr. Atkinson and Dr. Barker have given us will answer in every instance. I think there is something else besides degree; that there are some other conditions besides simple degree in action, or degree in force, I am fully confident.

Now that the manifestations of force may be different in many instances, where the difference is produced by the thing or object upon which the energy is expended, may certainly be true. We know this—for I shall persist in speaking of dead and of living matter—we know very well that the action of certain reagents upon living and dead matter is exceedingly different under similar circumstances. And if it is the medium through which the force is exerted which gives rise to a variety of manifestations, the variety is certainly due to something besides the difference in degree of force, for exert whatever degree of force you please upon a living being and it will not produce the same result as the same amount exerted upon that which is dead.

In regard to these light zones which were found near the margin of carious cavities, I think it is perfectly philosophical; it accords perfectly with what we do know of vital action and physological action to suppose that it is due to the very cause that Mr. John Tomes supposes it to be due to.

Dr. Atkinson: As I understood Dr. Waters, he was perfectly correct in his statement. Had I been present and witnessed all the preparation of his specimen so as to determine whether he had got some fungoid growth by carelessness into the interspaces of the enamel and dentine that he speaks of, I would be more competent to give an opinion. The appearances which he has so beautifully described are only to be seen

by high power, and we are not aware of anything but vegetable productions that assumes that form. It is but an articulated mass, and one of the most profound microscopists living, Heitzman, an enthusiast in this department, has described what I understand Dr. Waters to have described. But that it has any connection at all with the process that he was detailing as a process of retrograde metamorphosis in the enamel structure, I have not the least faith. He did not tell us that he had filed it all away, and could assert whether these interspaces in the enamel rods were not gaps left in the process of calcification during the formation of the enamel rods. He made another statement that to me is very heterodox; that it gave out carbonic acid, and that was one of the evidences of its being vegetable. Well, he must have had some "crooked whiskey;" he got tangled in his evidence. Animal substance exhales carbonic acid, and inhales oxygen. There are few examples in the vegetable kingdom where they give off carbonic acid in the dark, but to take it as a rule is a misnomer and mistake. If the Doctor simply made a slip of the tongue he can correct himself about that, for we are speaking to young men who shall take our places when we can no longer have the privilege of coming head to head, and heart to heart, and give the results of our labors that were gathered from much toil and affliction, when we had nobody to help us and say "God bless you." The time is coming when we shall be awake, and our enthusiasm will rise, and we shall be so stirred as to get above the low conception that there is anything that is not alive, that there is anything to be seen that has not in it a modicum of energy—force; for even the atoms which never were created are original and absolute—hold within themselves bonds that, when they are awakened by the proper nearness and the passage of a current of energy which we call electricity, then they awake and unite in exact proportion to the bonds of chemical equivalency when that chemical mass has a certain number of bonds that are awakened by a definite number of bonds of the other atoms, and it is because of the number of these bonds that we are able to write the chemical formula. This point I wanted to make clear, and would be glad to show the degree, although we have no means of measuring the degree or what the bond of affinity is. You cannot weigh it, neither can you weigh an equilateral triangle; but when he gives the definition of the schools, that "it is a triangle with all the sides equal," it is simply a repetition of the first statement that it is an "equilateral triangle." What did I use this simile for? To show you it was not possible to measure how much was infinite, but that it is some measure, and that some is exactly equal to the other some that balances it. Ad—equation means balance of energy; balance of energy means expression of energy by what we call the forces, and

that is precisely what is awakened; should you try to annihilate any body, I don't care how "dead" or "damned" it is in your estimation, see if it don't wake up as one of the sixty-nine elements that we now know of, that go to make up the atoms. That is the evidence that there is no such thing as "dead matter."

DR. JUDD: I have only a single word to add, and that is in relation to the statement that Dr. Atkinson always insists upon. There does not seem to be so wide a difference in the way we think. I stated that I was not an advocate for a multiplicity of forces. We do not know about that: there may be one force, and there may be more, but what I do advocate is this, in regard to this word vital as connected with life. I stated before, that the difference that has given rise to the doctrine of a multiplicity of forces, may have arisen from the difference in their manifestations, and that the difference in their manifestations may have been produced by the substance through which they were manifested Suppose for instance for the sake of argument that we confess that there is but one force in nature, and that all of these conditions, as I said before, may have been produced by the different substances through which they are manifested.

DR. ATKINSON: One power, many forces.

DR. JUDD: Well, those two words are used by some authors as synonomous.

DR. ATKINSON: That is what I find fault with.

DR. JUDD: By others they are used—*power*, ability to produce effect; and *force*, the active influence which produces it. There is a difference of opinion as to how they should be used, but what I wanted to say was, there is, for instance, a force which we call a cohesive force, which draws the particles of matter together. We do not call that vital. It may be of the same force however, that produces vital action; but we speak of certain manifestations of force as vital action simply because by the word vital we communicate certain ideas to the minds of others connected with certain phenomena which we find in living beings, and which we find nowhere else. Then it simply comes to the question whether or not this is a word that is understood by the mass of those to whom we speak, for the purpose of language is to be understood, and language is proper or not proper as it accords to the general usage of the best scholars of the day. So you see

where I use vital, I use something beyond what the gentleman means when he speaks of cohesive force, designating force manifested in a certain way, and I hold it is perfectly right and proper to use the word in that way.

DR. WATERS: I wish to say that in regard to the case of which I spoke I did not venture to call the attention of any scientific body to it until I had presented it to quite a number of members of the dental profession, among others the microscopists of the Massachusetts Dental Society, and the Merrimac Valley Dental Society, both of whom pronounced it as something they had not before met with, and they did not venture to pass upon it. But as far as the appearances are concerned, they all seemed to see what I thought I saw. Having had their opinion, and seeing that they saw as I did, I carried these sections up to the Boston Society of Natural History, and presented them to the botanical section, where some of our best microscopists belong, and they all saw the same appearances. Some of them thought that part of the appearances were due to animal life and part to vegetable life.

I was aware that animals give off carbonic acid, and that vegetables, as a rule, do not; but I was also aware that the lower class of vegetables, particularly the fungoids, give off carbonic acid in great abundance, and it was to that class that I supposed they belonged.

DR. SPALDING: It has been said by some speakers that vital action had probably a great deal to do with these processes which have been described. I am prepared to go farther than that. I am prepared to say that vital action in my opinion not only has a great deal to do with these processes, but that it controls them. We have in the first place manifested in the physical body throughout its processes all the different forces of nature. We know what the physical forces are, and we know that they all have a certain effect, and produce certain results. We know that chemical force in itself is precisely the same whether it is in the human stomach or whether it is in the alembic of the chemists; but when it is in the human stomach it is in a different condition, for the reason that there is operative a vital force which dominates the chemical force. Vital force dominates all the physical forces wherever they manifest themselves throughout the entire domain of physiology. Hence although chemical forces act, they act only in subservience to the demands of vital energy in all its behests. They can act in no other way because they are subordinate to the special dominating

force. I might go on and illustrate this idea by a few examples, but it is unnecessary to mention the facts if you comprehend my position upon the subject.

A great deal has been said also about the living and the dead, and that this is dead and the other living. Let us see for a moment what life is. How can I give you a short definition of my idea of life? Of course there is no motion without the force that creates that motion; and wherever motion acts upon matter, there is a manifestation of the activity of that force. I would then say that life is matter in motion; that physical life, the life which pertains to physical nature, is matter in motion.

A MEMBER: Where does it get its motion?

DR. SPALDING: From the force that I have just been describing. All the forces are dominated by the special vital force which comes from above. There is a living force which builds and constructs; there is another force which takes down and disintegrates; but they are both equally forces. The force which destroys is no less a force in itself than the force which constructs; but it is operated in a different way of course. These seem to me to be the radical differences between the forces that we call living and those which we denominate dead. There must be words to express ideas, and we must have terms to designate whether we are talking about a building force or a disintegrating and destroying force. One we call a living and the other a dead force, but they are both forces.

DR. MCQUILLEN: This subject is one I feel a deep interest in, and which twenty odd years ago I devoted considerable attention to the microscopic examinations of, and placed on record in the DENTAL NEWS LETTER, Vols. 11 and 12, the result of those observations. I have not taken part in the discussion up to the present time because I desired to hear what others had to say on the subject; to ascertain whether the views then advanced were sound, based in fact, and logical; for I recognize that we are all liable to err, and no one more liable than myself. In listening to-day to the various views which have been advanced, it seems to me the opinions I presented on that occasion have been rather confirmed than disproved. I am inclined to regard this consolidation of the dentinal tubuli, or the deposits in the dentinal tubuli, as the result of vital action. We might with just as much propriety say that the changes which take place in the other portions of the osseous system (for the teeth are but part of the skeleton), are

not the result of vital action. There are certain diseased conditions of the bones (rickets), in early childhood where the bones are soft—have not a due supply of the inorganic constituents, and we know that in course of time, with a change in the constitution of the individual, these bones become hard. How is that effected? Is it by any other process than vital action? Again, in the osseous system, even in the most perfectly organized systems, changes take place, and bones that were perfect become softened during the period of utero-gestation on the part of females. And there is an old aphorism which has been looked upon as the mere utterance of a nurse,—and yet these vulgar aphorisms sometimes have truth as a foundation—"that for every child a mother bears she will lose a tooth." Here we have an illustration that not only is there a change in the condition of the skeleton, that the bones will soften, but that the teeth themselves are softened. There are those around me who can bear testimony to the fact that teeth which during the period of 17, 18, or 19 years of age, prior to the marriage of young women, have been hard, after marriage become exceedingly soft: due undoubtedly to this change taking place. Therefore I am disposed to regard the changed condition in the dentine which we speak of as consolidation of the dentinal tubuli, as the result of vital action.

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I shall not enter into the hair-splitting differences that are presented here between vital action and chemical action. Like my friend, Professor Judd, I think we should take language as we find it used by educated men, and regard certain words as meant to convey certain ideas. How does this change take place, however? It has been said here that there are two views in relation to the formation of dentine, as to whether there is a deposit of inorganic matter within the cells or whether it is a secretion from the cells. As has been very justly remarked, we cannot properly regard these cells as secretories. The odontoblasts in dentine and the osteoblasts in bone are tissue builders; they have a certain function to perform; they appropriate from the blood, materials that are subservient to the building up of the tissues, and any changes which may take place eventually, are effected through them. These odontoblasts are arranged around the outer portion of the dentinal pulp, as the membrana eboris. A theory has been advanced in explanation of the conversion of these odontoblasts into dentine wherein it is said that first there is calcification between the odontoblasts, forming what is denominated the inter-tubular structure, and then a conversion of the peripheral portion of the odontoblasts, constituting what is called the sheath of Neumann, and then the central portion remaining in a softened condition constitutes the dentinal fibrils. That these dentinal fibrils can undergo

change, that they can take up the inorganic constituents that are present in the blood, is as reasonable as that the odontoblasts themselves were originally capable of taking from the blood these constituents. I have in my possession an interesting specimen prepared by my friend Dr. Flagg some years ago, showing this peculiar condition of the dentine, which I shall be happy to show to the members, under the microscope, at such time as may be convenient for them.

VOLUNTEER ESSAY.

Is the Dental Pulp Essential to the Integrity of the Tooth Structure, or to the Continuance of the Teeth in the Mouth till Old Age?

By L. C. INGERSOLL.

I cannot discuss my subject wholly as an independent question. I shall treat it from a therapeutical as well as a physiological standpoint. Its therapeutical aspects present themselves to us in the light of the physiological relations of the pulp to the tooth structure, and the relations of that structure to the functions of life. The question involves, therefore, the practical merit of all pulp treatment, based as it is on our estimate of the intrinsic importance of the pulp. In proportion as we regard it ever and always chief of the dental tissues or lower in its relative importance, will be the persistency of our treatment to preserve it.

Early in the practice of dentistry, known exposure of the pulp was treated with devitalization of the organ. For half a century attempts have been made with varied results, to cover the exposure and restore the pulp physically and functionally to its normal condition. For a quarter of a century the preservation of the pulp as opposed to the earlier practice of devitalization, has gained the special and almost universal attention of the profession. It has employed the inventive genius, the studious research and the maturest thought of our best minds; it has been made the acme of professional skill, the criterion of professional standing. In the enthusiasm

of professional progress it has been pronounced "a crime" to extirpate the living pulp of a tooth. Rising to this high plane and *looking down* on inferior things, it may never have occurred to some that they *may* have occasion at some time, to return to the plane below for supplies.

Throwing aside the vast variety of materials which have been suggested and used as a mere mechanical covering of the opening into the pulp chamber, the profession seem to have rested with almost universal confidence in the use of oxychloride of zinc as superior to all other materials which have been proposed; not only because of its ready adaptability, but because of its supposed therapeutical effects. The profession, too, by a very large majority seem satisfied with the success of the treatment. Judging from the reports of cases, there is a marvelous uniformity in results, greater than in the case of most specifics, and as complete as can ever be reasonably hoped for through the fallible instrumentality of human judgment and experience. If then the *reported cases* carry with them no lingering doubts of their reliability, the evidence is overwhelming; and to esteem a pulp, in any condition of its life, of little importance, is being false to nature, and to extirpate a living pulp is most flagrant malpractice.

Let us take a moment's glance at the value of *reported cases*. In the excellent paper of Dr. Howe, read before the Odontological Society of New York City, he has collected reports of eight hundred and fifty-three cases treated by a number of operators, fifty-four of which cases proved failures; while the reports of a large number of dentists whose opinions he cited as favorable to the use of oxychloride, did not give the figures concerning the success of their practice. I have not gone to the authorities which Dr. Howe has cited to learn what remarks or explanations accompanied these reports, but I have this to say concerning reports of cases as *ordinarily given* to us in society meetings and in the journals: They do not, to my mind, bear the marks of reliability. I want to put the gentlemen who with so much confidence in their success, make these indefinite reports, on the witness stand and question them, that we may learn their diagnosis of the cases they have treated, and ourselves be able to judge of the probability of their fully understanding the pathological conditions.

Your cases are *reported* as representing a well marked and definite condition which you call *exposure of the pulp*, and your treatment of the cases is fixed and definite, viz., the use of *creosote and oxychloride of zinc*, and your success is defined simply by the word success. Now, sirs, allow me to ask, what do you mean by exposure? Do you regard *alike* the

opening as broad as the diameter of the pulp chamber and the opening as small as a pin-hole? And do you call that an *exposure* where the only opening is through the emptied tubes of the dentine, and only microscopic? Do you call that exposure which is made by excavating over a healthy pulp and that which is produced by the progress of decay, one and the same thing as regards treatment? And do you employ the one covering or capping material for all these different stages of approach to the pulp chamber, placing your cap directly upon the exposed face of the pulp, or upon the intervening dentine, as the case may be? And the pulp—is the condition of it always the same whether the exposure is great or small? Is the condition of it always the same whether caused by an excavator suddenly, or by the slow progress of decay? The treatment—is that the same, whether the exposure has been of brief or long continuance,—with creosote and oxychloride? Does every condition, whether it be irritation, determination of blood, congestion, or suppuration, succumb alike to your *one* treatment—the creosote bath and oxychloride? Do you *know* that the pulp will remain in a healthy state with an artificial covering—done up in a rag like a sore finger, or like the sore finger that it will *re*-form under the rag its own natural covering? Are you sure that secondary dentine will be formed after the peripheral cells have been obliterated as a result of the exposure? How long after the first indication of exposure can the pulp be treated with success? And what do you call success— the comfortable condition of the tooth for one month, for six months, one year, three years, or till old age? What are your tests of success? Is there no deception in cold water, ice, percussion and the drill? Are your patients so versed in pathological sensations as to report to you understandingly and without self-deception the twinges of experience that may follow the treatment of their teeth?

This is not all, but it seems to me that I have opened up the case sufficiently to show the absurdity of trusting to random reports made up of four terms—*exposure*, *creosote*, *oxychloride*, *success*. The desirability of the object to be gained makes an interested practitioner eager to catch at the first hint of successful treatment, especially when so simple, without consulting conditions and circumstances that might modify results. Thus did the ass carrying his burden of wool through a stream. When he saw his companion, the mule, having his burden of salt sensibly lightened by getting it wet, he bent down to dip his sack of wool in the water, but with quite a different result.

In the diagnosis of any case presented for treatment, we may approach many facts with considerable certainty; but there are in the treatment of

every case at least two unknown quantities—vitality and idiosyncrasy. With these in the dark, our practice must be empirical; and cases must vary in the results of treatment, vexing us with contradictions and logical absurdities. We need but a slight review of specifics and medical formulas to convince us of the unreliability of "cases" as commonly reported. Explosions of theories and accepted practice have followed each other in quick succession down the channel of the ages, chafed by the sharp touch of contrary opinions. Yet each in the period of its inaugurated success was substantiated by its list of reported cases—"most profitably numerous." I am constrained to believe with Sir Benjamin Brodie that "there are epidemics of opinions as well as of disease."

Edward Spencer in his paper on "Medical Fashions," among numerous points illustrated, pricks the bubble of *reported cases* with several examples. He mentions the case of one Dr. Spalding who in 1819 published a pamphlet in which he attempted to show that a decoction of the dried plant of the common *Virginia Skull-Cap* was an infallible preventive of hydrophobia, as well as a cure of the disease after attack. He cited the cases of eight hundred and fifty persons bitten, of whom only three were attacked, and these recovered. He claimed also to have used it with uniform success in the treatment of eleven hundred animals. But the mysterious disease rages still, and the skull-cap has "gone to the dogs;" not however to those that have hydrophobia. Not many years ago Dr. Fell discovered an infallible cure for cancer, found in use of *sanguinaria canadensis*—common blood-root. With his remedy he went to London and became so popular, rich and marvelously successful, that he was finally put in charge of the cancer ward at Guy's Hospital, where his whole system collapsed as signally as it culminated. It is fresh in the minds of many of us—and in the throats of some—that a celebrated doctor of New York introduced a method of treatment of throat and lung diseases by means of caustic introduced on a probang inside the glottis, and claimed to have performed this operation one hundred thousand times. He was indicted for manslaughter for one of his failures; and who has his probang now? His sucesses were very numerous, and for a time the profession near and far adopted his treatment.

Twenty years ago other treatment than the oxychloride of zinc for capping pulps was reported as successful, compared with the number of operators, as is the favorite treatment of to-day. The effort now so universal among the profession to save the dental pulp from death by disease is most

commendable; and our only fault seems to be in believing *too confidently* that we do it. I would not include all, for the experiments and tests of some who are cautious and guarded in the selection of their cases have been thorough enough, and have reached over a period of time sufficient to warrant a belief in the permanence of the vital condition of the pulp of a majority of the cases they have treated. But from my observation of the treatment of cases by myself and others, the majority of cases are failures in from eighteen months to three years. The early method of devitalization of the pulp *without extirpation* proved in many cases successful, with no unfavorable results appearing for years; while most cases would remain a reported "success" for a year or a year and a half, when abscess would ensue.

Probably a fair statement of the case as concerns the treatment of the dental pulp by all classes of practitioners is this: A large number of the cases *called* exposure of the pulp are cases of irritation caused by thermal changes or osmosis of oral fluids, without having caused inflammation of the pulp. In such condition the base of the cavity is extremely sensitive to the touch of an instrument, because of the thinness and elasticity of the plate of dentine still covering it—is sensitive also to cold water and to air. Another class which have been called cases of exposure of the pulp were cases of simple inflammation, and were readily relieved and the pulp restored to its normal action, by giving relief from such causes of irritation as I have named above. Another class of cases treated are those cases of *real* exposure caused by violence in mastication or by the work preparatory to filling, and brought under treatment without delay. There is no doubt that the three classes of cases named have been treated with the oxychloride capping with complete and permanent success. If only such cases as these were presented to us, cases that could be with a good degree of certainty known to be such as I have named, we could by careful manipulation, employing not only oxychloride of zinc, but any other material which has been proved by experimental tests to answer the conditions, no doubt reach a high average of success. But the pathological nomenclature of these *reported cases* covers with a single term all cases of exposure—the worst forms of exposure and those of long standing; and includes those cases where the pulp is undergoing the process of elementary destruction. In nearly every such case I believe that the oxychloride treatment only helps the pulp to die easy, and embalms it for a season after death.

I come now to the direct question—Is the dental pulp so essential to the integrity of the tooth structure when matured, and is the treatment of

it in all diseased conditions so simple and uniformly successful that deliberate extirpation is an unwarrantable practice? And, furthermore, does the continuance of the teeth in the mouth, comfortably and usefully, depend largely upon the functional support of a living pulp? To this double question, and to each of its parts I answer, no. I have already given my reasons for doubting the reported success of treatment based upon a high estimate of the intrinsic value of the pulp.

Let us now turn our attention to the integrity of the tooth structure as affected by the presence of the pulp. It has been stated and believed by many that vitality in the teeth protects them from decay. The analogy of inanimate nature and of the soft animal tissues is adduced in proof. It is well known that if the vitality of any portion of soft tissue terminates, the substance rapidly decomposes. But the law does not hold good concerning the hard tissues. When the English king, Edward III, died, a few weeks, or months at most, were sufficient to decompose all the devitalized soft tissues of his body. But the devitalized hard tissue of his teeth retained its integrity for more than three hundred years, when his remains were exhumed. If vitality is essential to protect the teeth from decay, the enamel, which is the most exposed and must first fall a prey to the wasting influence of decay, would, in the wise economy of nature, have been more vitally supported. Vitality in children's teeth has a wider area, and more formative and reparative energy than in adults' teeth, yet they decay more rapidly. Such facts are sufficient at least to create doubt, and a necessity for strong proof. Whatever foundation there may be for this theory, it probably has its strongest point in a single fact, viz.: When the progress of decay has been arrested by any accidental condition or applied remedy, by a vital process, the dental fibrils are calcified, and thereby the body of the tooth made more dense and better able to resist the influences producing decay.

The chief office of the pulp among the dental tissues, is that of being the formative organ of the dentine. To this work it gives up its life. In the performance of this function it gradually exterminates itself. Thus by a law of its own it *tends to self-extinction*. In advanced life, teeth are found with the pulp chamber and the root canals so wholly obliterated as to afford only the narrowest space as the grave of their former occupant. All that remains is the shriveled skin of the extinct pulp; and the walls crowd hard upon it. In studying the high importance of the dental pulp, bear in mind this tendency to diminution and self-obliteration. Having completed its formative work, the indications of nature are, that the pulp has little more

to do. In this view of the case the decisive question to settle is, at what period in life can it be said to have completed its work? When do its legitimate functions terminate, so that it becomes of little consequence whether it lives or dies?

There is a period of growth and development, and a period, no doubt, of maturity—when the human body stands complete in all its form and functions. The precise time when this period arrives, dating from conception or birth, will vary by months and years with different persons. It is assumed as a common average that from eighteen to twenty-one years are required to give physical completeness to the human body—the female maturing in less time than the male. Whether the time generally conceded be strictly correct or not, it is not material for us in the present discussion to pass judgment. So much of the formative work of the teeth is carried on before they emerge from the gum, that I think we may safely say that they become thoroughly mature for their functional work in ten years after their emergence---counting the same number of years for each tooth after the time of its emergence. I will quarrel with no one as to the absolute correctness of this estimate. The number of years required in any case will be estimated by the ability of the organ for the complete performance of function. The pulp at this period takes its rest. The enamel organ exhausted itself at an earlier period, and became extinct. The fact that enamel matures in hardness and brilliancy after the tooth has cut the gum, is, to my mind, no evidence of any remaining vitality in the sheaths that possibly may form the microscopic bond of union, laterally, of the enamel rods. The lime salts composing the enamel have such an affinity for the elements that load the atmosphere, that this cause alone is abundant explanation of the crystalline beauty which the enamel assumes after emergence from the gum.

If this view of the case, as concerns the waning functions of the pulp, seems unphilosophical---contrary to nature—I have but to refer you to the generative organs, that cease their function and take their long rest after the meridian of life; to the same organs also that *exist* in organic completeness, but never perform function through the entire period from puberty to meridian.

If I have rightly set forth the office work of the dental pulp and its relations to the other dental tissues, the profession have overestimated the importance of the organ in *mature teeth*, and have complicated their case

with more unmanageable disease of other tissues by too long continued efforts, in bad cases of exposure, to save the vitality of the pulp. The high standard of practice at present, requires me to conduct my diagnosis and decide upon the treatment of nearly every case with reference to saving the pulp alive, even to the preservation of remaining fragments of nerve in the root canals—to make even the worst cases a subject of continued experiment, and to be reconciled to death of the pulp only after, and as a result of, the failure of doubtful experiment—and this, because of its *intrinsic value to the hard structure.*

Viewing the case from the standpoint I have presented, *extirpation* comes earlier into the arena to compete with the well received practice of *pulp preservation.* And now, in the language of the law, there is a "change of venue," and a new issue too. The question is no longer the *preservation* of the *pulp* but the *preservation* of *the tooth*, and oxychloride treatment of the pulp as opposed to extirpation as a means of preserving the *tooth* in a comfortable and useful condition to old age.

Setting aside those cases of exposure where there is no established disease of the functions or structure of the pulp, as cases readily yielding to the "capping" treatment, all other cases come to us burdened with too formidable an array of doubts. to warrant the dentist in tampering long and risking much by pulp treatment, when so little is risked by pulp extirpation.

It is a well established fact that there are in the human organism, generally distributed, functional powers working at varying balance of each other for waste and supply of tissue—that worn-out tissue is being perpetually removed and new pabulum supplied to rebuild the waste. I believe it will be found that the teeth, that are an exceptional tissue in so many other particulars, are also exceptional in this. It is quite evident to my mind that the *enamel* is *not* subject to this law of waste and supply, and it is by no means an established fact that the *dentine* is subject to the law, except as pertains to its animal portion, which in a matured tooth is a very small proportion of its substance. The argument, therefore, for the preservation of the pulp, based upon its supposed value in replacement of lost tissue of the dentine, has too uncertain a foundation to carry conviction to the mind. Yet this is the strongest argument and the only one worthy of consideration that has been advanced for the preservation of the pulp. But after the pulp is dead, there can be no loss of dentinal tissue by absorption, hence no demand for replacement. The argument for the value of

the dental pulp in calcifying the dental fibrils after the maturity of the tooth structure, as explained in the former part of this paper, I have already inferentially answered.

The success of pulp extirpation consists in the *thoroughness* of the operation. The effort should be to remove every vestige of the devitalized tissue, even from the termini of the root canals. Should this for any cause be an impossibility, what remains should be dried of its watery portion, shriveled and embalmed. This cannot be done in a day; it takes time. Thorough work in extirpation requires very great patience and very skillful manipulation. Not what we may *wish* to do in conducting the operation of extirpation, but what we *can* do, is the dictate of sound judgment.

Therapeutical treatment is based upon our conception, not of physical forms but of the activities inhering in those forms and our estimate of their value to the organism. If in our therapeutics we have been led somewhat astray—though on the right side, yet *astray*—by overestimating the importance of the organ we have attempted to treat, and have often failed, we need not "mourn as they who have no hope," for there is hope still *for the tooth* in *extirpation* of the pulp. The cases of longevity and even of extreme age of pulpless teeth are so numerous that I need but to allude to the fact to stimulate your memories to recall them.

Henceforth let our watchword be THE SALVATION OF THE TEETH, not the salvation of the pulp.

DISCUSSIONS.

DR: RAWLS: The pulp, I contend, is necessary to the salvation of the entire internal structure of the tooth; and when we can have an entirety, surely it is better than a part. When we destroy any of the life-giving tissues of a tooth, there cannot exist the same chance of that tooth lasting as if it were an entirety. When we can save the pulp alive, and performing its function as it was intended it should do, it is much better than to cause its destruction; this for many reasons, and one of the principal reasons why we should, when there is a possible chance, endeavor to save this tissue alive is, that if we should resort to its destruction we must remove all that portion destroyed, check by antiseptics the decomposition of animal fluids contained within the dentine, and hermetically seal the cavity; this in very many cases cannot be accomplished, and if not so accomplished the results would not be of lasting success. When you protect an exposed pulp you are simply doing that which in case you destroy it, you purpose doing with the same tissue when it is severed at or near the apex of the root; and certainly if by any means you can save the entire pulp, with all its communications to the dentine, it is much better that this should be done; failing in this, you may try destroying and extirpating, and then if unsuccessful you may resort to extracting and replanting, and that too, with a probability of success every time, so far as my experience goes.

The paper states that the pulp was not intended to last longer than till a period when the filling up of the cavity might take place. I would ask how long does it take for nature to accomplish this? How many cases have been observed in which such results occurred, even in old age, and when it does take place, of what account are such teeth afterwards? Do you not find that after a patient has arrived at the age referred to, if calcareous

matter is thrown out, obliterating pulp cavity and nerve canals, there exists other signs of senility, such as absorption of the process and loosening of the teeth, such as would render them of hardly any consequence, instead of preserving them in the height of their glory and ready to perform the functions for which they were intended? You might as well say that the blood vessels, after having supplied the bones and muscles with everything that it was intended they should be supplied with, should then cease to perform their functions and leave the body to go in that condition without its usual life-giving resource. Again, with reference to capping pulps, it seems to me that the pathology of this organ has not been taken into sufficient consideration, that there have been no distinctions made between the different grades of inflammatory action which occur in diseases of the pulp; this I think should not be overlooked. One who understands how to care for an exposed pulp at all will understand how they should be treated; no matter what their condition be, he will know whether there is congestion or active inflammation, or whether there is suppuration or death of a portion, or of the entire nerve tissue, and I believe, from my knowledge of the intelligence of dentists in the United States, that they, as a rule, are pretty thoroughly posted in regard to this subject; the trouble is, they do not get the benefit of their knowledge, or give their patient the benefit of it by always putting it into practice.

There are some good points in the paper, and it is well enough they receive proper consideration, but in reference to the other points, I think the essayist has so presented them that a wrong inference might readily be drawn, thereby misleading many at least of the younger members of the profession. There is no doubt in the proposition that dentine should receive life and sustain its integrity through, and by the aid of, the pulp tissue, and circulating nutrient fluids therein contained, but there is doubt concerning the proposition that there exists no more use for the pulp and its ramifications after the tooth has once been completed in structural entirety. Again I repeat it, that when the circulation of nutrient material has been cut off by destruction of the pulp, the dentine will surely tend to disintegration, and this is wherein one of the difficulties exists in our efforts to save a tooth after the pulp has been destroyed and removed. If we could fill every root so as to hermetically seal it with some antiseptic substance which would neutralize or counteract the force tending naturally to disintegration, it would indeed be well, but this we cannot very often accomplish; but if life still remains in the pulp, the prospect for its restoration to health at the

point of exposure will be equal to, if not better than the probability of restoring to health the nerve tissues when they are severed at the apex of the root.

DR. BARKER: I cannot help differing from the conclusions presented by the essayist in his paper. I consider that its tendency is toward retrograde practice. In the successful preservation of the life of the exposed pulp is involved the highest expression of conservative dentistry, although it is no doubt true, as asserted by the essayist, that too great success has been claimed by some enthusiastic practitioners; but even failures are not always due to errors of judgment, as it is a well established fact that some localities are more favorable than others; in Philadelphia, for instance, my experience and also that of several of my professional friends, does not show a favorable proportion of successful results as compared with the number of pulps capped. This result is no argument against the practice; for non-success is doubtless due to either atmospheric or climatic influences, or it may possibly be due to some agent in our drinking water, which may by catalysis, modify the nutrient functions and arrest the development of the healthy odontoblasts.

Testimony that is unimpeachable proves to us that capping of pulps is generally successful when discrimination is used, in almost any locality, and while such evidence is produced, it is sheer folly to argue against a practice because in some locality it does not answer every expectation. If I understood the essayist correctly, he contended that the principal if not the whole duty of the pulp was ended after it had remained ten years in the tooth. To this position I take exception, and say that the function of the pulp should continue as long as the life of the individual. Everyone of any experience, has seen the structure of teeth modified at all ages by, and through the influence of some systemic disturbance. No better illustration of this can be given than that change which takes place in the teeth after convalescence from typhoid fever; for months after, their structure will be soft, with marked evidence of absence of calcareous elements, but under the influence of favorable circumstances and improvement of nutrition, the teeth will become hard and dense—the lime salts being restored through the medium of the living pulps. As another reason for the preservation of the pulp under every circumstance, when possible, may be instanced the consolidation of the teeth, as one of the results of advancing age, thus preventing and in many cases arresting, carious action. It is a well established fact

that after devitalization and removal of the pulp, teeth are more liable to become diseased than they were before such treatment; and it may be well to inquire why this is so, and to what it is due.

An examination of other duplex organs when in a pathological condition will furnish us with more or less instruction. Take for instance the lungs or the kidneys, and when from accident or disease one cannot perform its proper function, the one remaining will act vicariously, will increase in size and functional activity, but under slight unfavorable influences disease is established in the organ, the part never being in a physiological, but always in a pathological condition. The same action is seen after the destruction and removal of the pulp, for then capillary vessels of the peridontium are increased in size and number, and a more rapid circulation is the result, a modified condition of hyperæmia being established. This action is induced in consequence of the vicarious action, the blood supply to the tooth being only furnished by the investing membrane, and, as in the other parts, any slight unfavorable influence will readily establish a disease in that tissue.

The essayist has adverted with some bitterness to the use of carbolic acid by those who cap pulps and attempt to preserve them alive. An examination of the reasons for the use of carbolic acid, either alone or in combination with any of the essential oils, for all have been found equally effective, will establish the fact that any agent which combines the qualities (topically), of anodyne and protective, will be advantageous, and in carbolic acid these are decidedly prominent; it is also a gentle stimulant, and when judiciously applied will favor sufficient irritation in the pulp for the elaboration of the healthy odontoblasts, and without some irritation there would be no activity of cell elements, without which restoration could not occur. From conversation with many who had had failures in capping pulps, I feel satisfied that sufficient care was not extended in selecting the comparatively healthy to operate upon, for no favorable results could be expected unless the patient is of such a diathesis as to favor physiological rather than pathological action.

Dr. Sturgiss: Dr. Ingersoll will have to defend himself if some of us do not do it for him. I think, in the first place, that his paper is misconstrued, I do not know how willfully or maliciously. There is no question but that this paper is a practical one for the locality of Keokuk, and would probably be for Philadelphia if they knew how to apply its doctrines. I was astonished at my brother when he came here with his thermal changes,

and his locality, and his water. Dr. Ingersoll, I think, can do in Philadelphia what he can do in Keokuk. I do not wish to take a radical view of this paper; I think the paper should be discussed upon its merits. That Dr. Ingersoll, or anybody else, can save all the teeth that have exposed pulps, under the different degrees of inflammation, I suppose will be admitted is not true. One gentleman says that one of the last resorts is to extract and replant when there is any danger. There is danger in that in Illinois—maybe not in Kentucky. We sometimes extract, fill and replace the tooth; I have done it in a good many cases, but some of these I have lost. All have been done with apparently the same care, and in the same locality, and under the same thermal changes, longitude and latitude, but I have lost some and saved some. We may as well come down to this simple fact, that all exposed pulps cannot be saved. I have been successful in capping nerves, but in these cases the inflammation had extended but very slightly—probably all the inflammation was what I had occasioned myself with the excavator. If I cannot save the pulp in a healthy condition, I will devitalize and remove it, and try to save the tooth in that way. I agree, however, with the last gentleman, that it is essential to keep the nerve alive, if it can be restored to its normal condition of health.

Dr. Robertson: I do not agree with the position taken in the essay, in the statement that when a tooth is once fully developed the pulp has no further office or function. The pulp supplies the crown of the tooth with blood and vitality. The nourishment of the root of the tooth is supplied through its periosteum. Nature abhors a useless thing just as much as it does a vacuum; and we all know that when the crowns of the teeth are destroyed and the roots become useless, nature casts them away sooner or later. But, if by any means you restore the crowns to such roots, so that they may have proper exercise, they will remain in a healthy condition for an indefinite length of time.

Dr. Ingersoll: I am very sorry that I was not able to make myself so well understood that a member of this body should even have supposed that I came here to impose upon this association a paper which was utterly unworthy of its consideration. He went further and seemed to assert in his remarks that I opposed the use of oxychloride of zinc and creasote. I said nothing whatever against the use of these in suitable cases. I have used them with great success in cases in which I deemed them appropriate. Now to make this matter a little more plain, let me state, so that we may

come to the point of discussion intelligently, what I meant. The first point of discussion is just this, that we have overestimated the value of the pulp among the tissues of the teeth. Go back to the history of the treatment of exposed pulps 25 years, to the day when everybody devitalized exposed pulps. You will find teeth, in the mouths of our patients, doing service that have been pulpless from twenty to forty years.

That we have overestimated the value of the pulp is evinced by the great eagerness of the profession to find some method by which we may preserve all pulps alive; as though the pulp is as necessary at all periods in life as the dentine. We have striven to save the pulp because we have been accustomed to esteem it essential to the preservation of the teeth. The gentleman from Philadelphia says they are not generally successful in capping pulps in his city. What do you do when you fail?

DR. BARKER: If we have trouble we have to devitalize.

DR. INGERSOLL: That is the *very point* I made, and those are the kind of cases to which my paper referred, that should be devitalized at once. I admitted the use of oxychloride of zinc and creasote in three classes of cases which are *usually termed exposure.* When you come to a bad case that has been for two or three or four weeks or a year in a state of violent inflammation, giving constant pain and threatening suppuration, I would call it a pretty bad case. But the doctrine taught is to cap with oxychloride of zinc. Now my doctrine comes right in to meet such a case—do not tamper too long with that pulp and cap it with oxychloride of zinc. Devitalize it. Gentlemen say you must not devitalize a pulp, because it has functional service to perform to the end of life. It won't perform that service in this condition. It is tending slowly to destruction. Its functional power is gone, it barely maintains a morbid existence. You are much more likely by devitalizing such pulps, to preserve the teeth as servicable members, than, by capping, to allow them to die a spontaneous death, and leave a putrid mass in the pulp cavity and in the canal of the root. It is a question for determination in every bad case whether you will attempt a doubtful practice or that which is a certain one.

We have prized the pulp too highly. I find teeth that I treated in this way eighteen or twenty years ago in a good, sound condition today.

With regard to the pulp, its importance and its office, we acknowledge that it is the formative organ of the dentine, the chief substance of the

tooth. Having performed its work and developed a tooth structure capable for the complete performance of function, it has but little more to do. Thereafter it renders an inferior service in the vital support of the tooth. Pulpless teeth do not decay, as many suppose, with increased rapidity. They remain in the mouth—they testify to the truth. You will find pulpless teeth all over the country doing good service. The main point is, *after the tooth has come to its maturity*, to protect the peridentium from disease. The intimate relation between the peridentium and the pulp is such that whatever operates to disturb the pulp is felt in the surroundings of the root. You endanger the life of the peridentium and you are endangering the permanence of the tooth in the jaw.

DR. BARKER: What is the objection to making the attempt? How are you going to do any more injury than by making the arsenical application?

DR. INGERSOLL: The objection is to be found in the thousand and one failures we have in this practice. We fail in more cases in the attempt to save teeth by capping, than we do by extirpation. We endanger the permanence of the tooth by attempting to cap a long exposed pulp, and thus complicate the case with alveolar disease, resulting perhaps in abscess, whereas on the other hand we should by a careful extirpation avoid these dangers, and gain complete control over the disease.

DR ALLPORT: I remember that some thirty years ago when I commenced the practice of dentistry, I read a very interesting paper from Dr. Dunning, of New York, entitled, as nearly as I can remember, "The possibility or practicability of devitalizing the dental pulp and saving the tooth." At that time it was the general practice to extract all teeth in which the pulp had been exposed. And although Drs. Dunning and Maynard had succeeded in filling the roots of teeth with gold after the pulps had been removed, and saving them, the doctrine advanced was met with a general demurrer on the part of the profession. Since that time important changes and improvements have been made in this branch of practice. The advisability of the practice then so seriously questioned was soon fully demonstrated, and the practice was soon adopted by most of our leading operators, and thousands and probably millions of teeth have been saved in that way.

After this for the second time came up the question as to whether it was possible or practicable to save the pulps of teeth alive after they had become exposed. Many doubted it, and laughed at the idea, but success has been so frequently met with in the attempt, that but few of our first-class practitioners seldom destroy the life of recently exposed healthy pulps without an effort to save them. Still our friend from Philadelphia says that the practice has not met with success in that city, and assigns climatic reasons for the failure. That he is right as to the non-success of the practice there, is not for me to question, for surely he ought to know better than I. But that the sole reason of the failure is climatic, may admit of a doubt. As I did not have the pleasure of hearing Dr. Ingersoll's paper read, I am not quite sure that I have a clear understanding as to the ideas advanced in it; still, I infer from the discussion, that he is of the opinion that too much importance is in some cases attached to saving the tooth pulp alive. Just what his reasons are for this, and in what cases he would not save the vitality of the pulp, I do not fully understand. Still I agree with him that there are cases in which the importance of saving the vitality of this organ has been over-estimated. Now, while no one can advocate more strongly than I have, and do, the importance of saving the dental pulp alive when it can be done, and at the same time kept in a healthy condition, observation has taught me that living pulps do not always perform their natural functions, and when they do not, they cease to be healthy organs, and are more apt to become a nuisance than a benefit. In such cases, to avoid subsequent trouble, they should be removed We have all been in the habit of thinking that so long as the pulp retained its vitality, it as a matter of course performed its proper functions—maintained the circulation and the vitality throughout the dentine, and kept up a continual deposit of new dentinal material. But this, I am satisfied, is not true; for in many cases I have found the pulp living, and the dentine dead—as much so as if the pulp had been removed. In this condition the pulp has ceased to perform its proper functions, and is useless. To this proposition the question will naturally be asked, How is this condition—a living pulp, and dead dentine—brought about? That I can answer this question correctly, I am not quite sure. Still, I will, in a few words, do the best I can. I believe it is the generally accepted doctrine, at the present time, that the death of the pulp results from irritation, inflammation, congestion, and ultimate strangulation. We all agree that the dentine derives its life through the pulp, and we have been in the habit of believing that vitality in the dentine is maintained so long as the pulp remains alive. But I am led to believe that this idea is not correct—that it frequently

happens that the dentine in part, or in whole, dies, the pulp still retaining its vitality. While it may happen that the dentinal fibres may become highly inflamed, and portions of them die, without greatly affecting the condition of the pulp, it may be a question whether a high state of inflammation in the pulp can exist without seriously affecting and endangering the life of the dentinal fibres from strangulation, the inflammation in the pulp being subsequently reduced, and vitality in that organ retained, with its functions destroyed; a pathological rather than a physiological condition of the organ is thereafter maintained.

In practice we frequently meet with teeth which, from their peculiarly blue or opaque appearance, lead us, at first sight, to diagnose them as dead teeth, and we open into them expecting to find a devitalized pulp, but all of a sudden the patient apprises us that we have struck life. Upon examination we find that the dentine is entirely free from sensibility, and is in a part, or the whole of its structure, as dead as if the pulp had been removed. If the entire dentine is dead, the pulp is useless, and from its pathological condition, is liable at any time to give serious trouble, and it is far better practice to remove it at once, and fill the root canal with gold, than to fill the crown, and leave within the tooth a worse than useless organ.

Dr. Allen: There is not so much difference of opinion, I find, in listening to the various speakers, after all. They all arrive at the same conclusion, but express themselves a little differently. One point should be kept in view: we should take into consideration, in the first place, the constitutional diathesis of the patient, then examine the condition of the tooth to see whether the pulp is badly, or only slightly exposed. A successful course of treatment may be employed in the one case, and the same course of treatment in another will fail. The difference is in the nature of the case that presents itself. Secondly, every operator should "mix his brains with his work" all the way through, like Opie; we should investigate closely, and diagnose carefully.

Dr. Atkinson: I am pained, and I am pleased. I am pained to see men of broad intelligence not looking the ground wholly over, so as to clearly investigate all its departments. I am pleased to see that any progress has been made. I am also pained to see that some, who did run well for a season, are now crawfishing, as we say. They are going backwards because they have lost their enthusiasm to get hold of the foundation principles that enable them to diagnose the case properly, as has been said

by the last speaker; when they have accomplished that, then a very small degree of intelligence and ingenuity will dictate how to apply the remedies that may be successful.

It is no matter what a man's "experience" is. If anybody, that has the humility and opportunity, will come to my office, I will take the pains to get a tooth and show that when you split it open you can draw the fibrils out of the dentinal canals so that they will hang there, like little whips, just the same as you can disintegrate a bit of baleen of the whale. That is the type from which the human tooth learned how to do it.

The paper just read I wish to endorse in all the points I do not find fault with. It is folly for us to get up and kiss each other for the beautiful things that we say when we are all so lovely that we do not find a hook upon which to hang an objection. The point is this: that the ruminantia or cud-chewing animals have that kind of dentinal deposit that is nominated secondary or supplemental dentine, that does deposit regularly all the way, lessening the size of the pulp chamber, until it comes up to the end of the root, leaving the rest as solid as any other part of it is—a little more solid than the other part is—because in this process of calcification the calcific activity is so much more rapid immediately at the mouths of the dentinal tubes, that they are without uncalcified fibrillæ all the way out to the inter-zonal space, like a solid piece of lime rock, with a very few little tracks of uncalcified material.

It is said that we have made too much of saving the pulp alive. Would it not be more modest to say that we have made too little of knowing how to treat a pulp when it was in a pathological state? Would it not be well for us to investigate a little, before we do that which we cannot undo? That is the great thing! We may afterwards be illuminated, and then we shall say, "Out, damned spot!" to the uncomfortable recollection of our ignorance, but the "damned spot" wont "out," wash it ever so much. We had better enter a caveat against rushing in where angels fear to tread, in matters that we are either too lazy, or too much befogged, to make the investigation that shall make us masters of the situation; to know what we are talking about when we talk about nutrition of a pulp, dentine, or enamel; for the very moment we say that the pulp is of no use to the crown of the tooth, we acknowledge that there is some sort of nutrition that goes on even in the enamel. I want to ask if any of you have ever seen a filling of gold, that had been inserted into the pulp chamber to restore

the contour of the tooth, stand alone without any supporting walls of enamel or dentine, and for a term of ten or fifteen years render good service as a grinder? Has anybody seen such a case as that? If so, they will very naturally inquire, how is it that although well protected by a filling sufficient to stand for a term of ten or fifteen years, the dentine has crumbled away from around it? Does that sound like dentine, in a devitalized tooth, standing twenty, thirty, or forty years?

Leave the pulps in the roots of the tooth, if you care about the success and comfort of the operation! This is a sugar stick of mine, and it is so interesting to me, that I know it ought to be interesting to any man that dares to touch this sacred casket that contains the living man; that we shall not send him to his account in such a crippled condition that he cannot make the sign of recognition when he enters the gate, and has to be sent back to be patched up and remodeled, so that he can come in, in a shape to be recognized on the other side. That is the reason why I am down on fractional men; these men are not aware of how much mischief they are doing: There is no secondary product in the cavity of decay, however much we may hear about fillings coming out after they have been well put in, and leaving a polished surface. We must put our foot on such doctrines, when there are little ones near that may be led astray.

DR. NOEL: I want to ask Dr. Atkinson how it is that the fragment of a pulp in the root of a tooth can have any influence towards preserving the crown from decay, or what service it is going to render in preserving that tooth for service late in life?

DR. ATKINSON: I will answer the question as well as I can, if I understand what it is. It is like almost all the questions that shrewd men put to men whom they wish to entangle, mixing truth with perfect nonsense, and making the latter an equal factor in the manufacture of a complex question. The biggest lie that can be uttered is a half truth. There is no lie that is not of the truth. The object is to secure the nutrient activity of the enamel from the point where it is furnished with pabulum by the dentinal fibrils that constitute the nourishing part of the dentine, from there to the end, and a more important thing to secure the healthful circulation about the end of the root, so that there shall be no incipient abscess formed; and, with a great big emphasis, *preserve alive* the terminal ends of the vessels that supply blood to the nerve that comes from the branches of

the superior or inferior maxillary nerve, as the case may be, to keep up the neural activity that is essential to the vascular activity. Every time you destroy the nerve of a part you have paralysis and atrophy of the balance.

DR. ALLPORT: I have repeatedly seen teeth abscessed while the pulp was alive. I had one in the mouth of one of my own boys, which I showed to Drs. Dean and Cushing. I afterward destroyed the pulp and filled the root. I had one case where I put a large crown filling in a lower molar tooth, one fang of which subsequently became abscessed, and on drilling through the filling, I found the pulp alive. This I also showed to Dr. Dean. I subsequently destroyed the pulp and filled the roots. I could refer to many other similar cases, confirmatory of the idea I have advanced, but I mentioned these because they happened to be cases I have shown to others.

DR. CROUSE: I want to add my testimony in favor of saving the life of all pulps that it is possible to save. While listening to Dr. Ingersoll's paper, I was surprised at the supposed opposition there taken to the practice of capping exposed pulps. It seemed to me that the writer was almost entirely opposed to the practice; but his remarks on the floor would indicate that he does cap pulps, and that his practice, in this respect, was not very different from that of other men who act rationally in this matter; the difference being that he does not call a pu'p exposed, that I should, or that is generally called an exposure. But one only hearing his paper, would, I think, get the impression that the author did not believe in trying to save the pulp when once exposed, either because it had performed its mision and was of no further use, or else when once exposed a pulp could not be saved. From his remarks I should say his practice was not very different from mine, and I cap all freshly exposed pulps, and all pulps that seem to be in a healthy condition, rather than to devitalize them. We take some chances in either practice. Some of the pulps die under the caps, but even then the teeth generally remain in a comfortable condition, and without material change of color. A small per cent. will require after treatment. The same is true, but to a greater extent, of teeth that have had the pulp devitalized and the roots filled; some of them will abscess, and a large per cent. will discolor.

I wished more particularly to speak of the case of Dr. Allport's, in which there was live pulps and an abscess at the end of the root. It is my

opinion that he mistakes the condition there—that is, of a live pulp. It is something else; it is a filling up of the pulp cavity with something differing from a normal pulp; an enlargement of blood vessels, or an extension of some tissues that have some sensation in them, but not a pulp in a healthy condition by any means. I have seen those things frequently myself in my practice, but I have the first time to see an alveolar abscess with a healthy pulp in the same root.

DR. REHWINKEL: In listening to this discussion it seems that the tendency is to over-do. The danger now in our profession seems to be from a tendency to carry certain methods to the extreme. I had supposed that the point was long ago settled, that simple exposure should be protected, and that no attempt should be made to destroy a pulp of that kind. This is a condition of things that scarcely needs any argument in its favor. I think, as a matter of course, that every intelligent practitioner will run the risk of trying to save such pulps alive.

If we go to the second stage of exposed pulps, everything depends upon the proper diagnosis—not only as to the *extent* of exposure of the pulp and its pathological condition, but also upon a correct estimate of the capabilities of the recuperative powers. If it were possible always to perfectly understand the condition of the exposed tissue, and could we foresee how much nature would co-operate with us, we should be far less embarrassed as to the mode of procedure. It is proper, however, even in cases of that kind, to make every effort to save the life of the pulp. Through error in recognizing the extent of disease of the exposed tooth pulp, we may in our attempts to save, set up such an amount of irritation that death from strangulation may ensue; or else, the pulps may be quieted for the time being, but die at a subsequent period.

I believe that oxychloride of zinc is one of the most treacherous materials which we can use for the protection of pulps. There is a peculiarity about it which seems to be lost sight of. It does not kill like an executioner, but like a garroter. It is an assassin in the dark, leaving behind no convicting evidence of his work. I have often seen teeth which had been treated with oxychloride of zinc by operators whose names, even, gave confidence and assurance that the pulp was all right, and on commencing work with the belief that I had a live tooth to deal with, have been disappointed in finding a pulpless one. When oxychloride of zinc is used in cases of exposure, it may be a long time before there is any manifestation of trouble, and yet at no time is it reliable. If the root canals are closed so

thoroughly that no fluids can enter, it is all right, otherwise trouble will surely follow. I think it is a barbarous practice to extirpate the living pulp. I never do it under any circumstances, while we have other means to accomplish the desired object without pain. There is a great deal in the paper to which I subscribe, though in some respects it is, perhaps, a little overdrawn, and liable to be misconstrued.

DR. MORGAN: I consider the paper very skilfully drawn, but there is a charge, by implication, upon the profession of pretending to do what they do not do; a charge, by implication, that the profession are in the habit of saying that they protect pulps and save them when the pulps are not exposed, and in his classification, out of the three cases that are said to be exposed, two are of a class where there is no real exposure; and he leaves the impression upon the mind of the hearer that members of the profession are in the habit of practicing this sort of deception. I think better of my professional brethren than that, and I do not think the charge well founded.

DR. INGERSOLL: Any imputation of that sort was foreign to my intent. I was simply mentioning it as a fact that they were performing this operation of capping what they called, and supposed were, exposed pulps, which as a matter of fact, could not be rightfully considered in that category. It was understood that they had accomplished something which, in fact and in reality, they had not.

DR. MORGAN: That makes the matter worse than it was before; a charge of ignorance—that they, the dentists, are not capable of examining and telling whether the nerve is exposed or not. Where there is extreme sensitiveness, without making a thorough examination they are so slovenly that they go on and fill a tooth and declare the nerve exposed when it is not. I think that part of the paper should be a little corrected before it goes to the world.

There is another point with regard to those cases where abscess occurs and there is a live pulp. That might occur in a tooth that had more than two roots. An abscess might occur on one of them. There might be a live pulp extending clear up into the pulp chamber, but if the abscess covers the point of the root, it is dead to a moral certainty. An abscess never occurs until there is that amount of inflammation which would cause strangulation of the pulp, and consequently its death.

Dr. Allport presents a case where the crown of the tooth is dark and where there is a live pulp, and asks what is the cause of this appearance. There may be a portion of the crown of a tooth devitalized without the entire crown being so devitalized, and it may have that discoloration; in other words, when excavating upon the grinding surface of the tooth, in cutting in, you may cut across the dentinal tubuli, thereby destroying the circulation in the enamel. A large portion of the crown may be devitalized while the pulp is still living, because the communication between the pulp, the dentine and enamel is cut off; for, the very moment that is done, disorganization begins, and, in the course of time, there will be a breaking down of its structure.

One other point: gentlemen have said here that we over-estimate the value of a pulp, consequently the value of its vitality. How do you determine that value? I stand here to say that I care not what the estimate may be, it is never an over-estimate, because it is life. It is that which you may take, but which you cannot restore. (Applause.)

Dr. Noyes: We need not stop to question too closely as to just exactly *how much* the tooth pulp is worth, since the undoubted fact that it is worth *saving* whenever possible furnishes us a sufficient guide for practice.

Dr. McDonald: While there are many good things in Dr. Ingersoll's paper, there are other things suggested that may lead "the infants" of Dr. Atkinson astray. When he makes a claim that we have over-estimated the value of the dental pulp, I have to enter my protest. I have treated a great many exposed pulps, and have met with a fair degree of success, and with some failures. Is there any dentist here who never meets with a failure in any department of his practice? My idea of the treatment of a tooth is this: if we have a pulp exposed, attempt to save it, and if we fail, let us endeavor to learn of some man who knows more than we do, how to save more of them; then if we fail to save the pulp, we can extirpate it. My friend says we shall have an abscess. Cure the abscess. Any-one who understands dentistry as he ought to, can cure an abscess as well as extirpate a pulp. I advise no man here, after hearing the discussion of this paper, to go home with the idea that he has a license to extirpate every pulp he meets with. It is our duty to save every pulp we can, and if we sometimes fail, try to improve by that failure. If a man tells me that he can perform a certain operation in dentistry that I have failed in, my idea is not to say it cannot be done, but I take the ground that there is something, which may appear very simple when properly understood, which I do not know about, and I am going to find that out.

DR. NICHOLS: I, too, have a great solicitude about young men, as well as the gentleman who has just preceded me, and I would hate very much to have a young man go out from this meeting and *indiscriminately* cap pulps with the expectation that that was going to be good practice, because I know from my experience and from the evidence in my own daily practice that he would be following a most pernicious course. All should exercise constant judgment. The usefulness of the pulp depends on its healthy condition; if that is impaired it should be removed, and the work in the roots should be done thoroughly; and I am willing to go on the record for saying that the tooth that has had a pulp extirpated properly, and has had the roots filled properly, may remain useful a life-time. I care not about "disintegration," nor the discussion of fine theoretical points; what I know in regard to this matter comes from observations in my practice, and I have observed conscientiously. There may be a question between my ability to observe, and the ability of some one else. It has been thrown out here, two or three times this afternoon, that certain other parties lacked the ability to observe. Perhaps they do, but when they have observed they will draw their own conclusions, and they will base their practice upon those conclusions. My practice, based upon my own conclusions is, that when a pulp has been long exposed, devitalize it at once. I think that is the only good practice. *If we know that it is useless, it should be taken out.* As Dr. Ingersoll says very truly, it is our duty to preserve the tooth when it is a question between the tooth and the pulp. Attempting to save the pulp in certain conditions, we shall inevitably destroy the usefulness of the tooth. Dr. Allport's practice, I believe, as he enunciated it here to-day, to be the soundest that has been enunciated on this floor; and although I revere and feel very much indebted to our friend Atkinson, I certainly must go on the record against him as to the indiscriminate attempt to preserve the pulp under all circumstances. We should not destroy pulps under all circumstances, nor can we preserve them under all circumstances. We must use discrimination, and do that which appears to us best.

DR. MCDONALD: The gentleman who has just left the floor hopes the young men will not go away from here and indiscriminately practice the capping of exposed pulps. The whole discussion ignores the fact that if we are not successful in saving the pulp, our chances are not lessened for saving the tooth. I hope that every young man on returning to his home will endeavor to save every pulp alive, knowing that if he fails in this he can resort to extirpation.

REPORT ON PHYSIOLOGY.

By J. N. FARRAR, of the Committee.

The Importance of Direct Sunlight in the Operating Room.*

At the last meeting of the American Dental Association Dr. A. H. Brockway read a paper on the relation of modern mechanical appliances in dentistry to the health of the operator, showing their beneficial influences over the more laborious customs of former times; a phase of hygienic physiology of prime importance to all who follow our calling.

Not expecting to propound many new truths, I propose to begin where Dr. Brockway left off and extend the inquiry so far as to cover the ground of location of the dental work room; for this appears to me as important a phase of physiology as some of the more concrete aspects of this subject.

In discussing this question it will be strange if some of my remarks do not meet with strong opposition, for nothing is more difficult to overcome than old traditional beliefs, habits and customs. But what little may be said will be all the more earnest because of my having personally experienced the advantages and disadvantages of the different kinds of light.

The object is to show that the policy of working all day in a north light is not only unhealthy, but, that shaded light is no better for doing fine work than sunlight, if it be, indeed, so good.

* Owing to the great length of this report, extensive quotations from high medical and scientific authorities have been omitted as being simply corroborative of the facts already established.—[Pub. Com.]

The influence of "Sunlight" upon physiological life is one of those deep and almost unfathomable subjects which, with our present limited information, can only lead us to form conclusions in regard to its value from the sum total of its workings. As with the relation of vision to thought, and thought to brain, we must be satisfied, for the time, by the existence of their outward expression and inward feelings, that these things are facts, and that they are certainly functional expressions of degrees of intensity of physiological actions, which are more or less dependent upon outward forces through food, air and light carried to and digested in the chemical laboratory of the system by motion called exercise. To deny the essentiality of the dynamic potency of the triad of which sunlight is a factor, is to deny the truth of what we see. That occasionally there are to be found north-light dentists who, by their inherited iron constitutions, can withstand this violation of hygienic law, only proves the elasticity of their nature; but, as a rule, if we inquire into such exceptional cases we shall find that they are not constant workers, and have frequent "off hours" of out-door exercise.

It will not be advocated here that sunlight in its greatest midsummer intensity, when its heat may be sufficient to change some of the albuminoid substances of the tissues to a pathological condition, is desirable; but I simply wish to show the beneficial influences of moderate intensity of sunlight. Sir David Brewster says, "Sunlight is the very life blood of nature." "Where light is not permitted to enter, the physician will have to go," is the well-known old Italian proverb. The grateful and sweet power of sunlight is not confined to organic bodies, but extends over so-called inorganic matter also.

Leaving the links of theories and hypotheses of the analytical feature of light to the Tyndalls, Sommels, Magnuses and others, to work out the chain from cause to effect, let us survey the conclusions from experience among results as a whole, confining our remarks to the physiological and psychological influences of sunlight in relation to the occupation of dentists, who, as a class, still persist not only in the practice, but apparently in the belief that the north light is more advantageous to their well-being. They argue that because north light is more steady, it must be, as a matter of course, best; which is equivalent to saying that the muscles of the iris are not to be depended upon for adjusting the amount of light necessary to proper vision; as if development by the exercise and the education of the visual organs is a myth; as if artificial appliances about the windows are of no use or benefit; and, finally, as if sunlight operations are necessarily inferior to those performed in the shade of a north sky.

But, laying aside the subject of office practice and generalizing our thoughts, probably no question, by a body of men like this, would be more readily answered correctly than that the sun's rays are of the utmost importance for the maintenance of physical health, beauty, longevity, and integrity of the intellect; or that living tissues when confined for a considerable length of time from the sunlight, will undergo degeneration.

From times of old the sun has been considered as having more or less influence in the regulation of vegetable and animal functions, both in disease and health. Apollo was not only the name of the sun, but he was also considered the god of medicine, and was worshipped as such. The influence of shade is so general and so persistent in its effects upon organic life that although there are some few apparent exceptions, yet it may be laid down as a rule that all people who pursue their calling in places where the sunshine is hermetically shut out, suffer more or less in their physical and mental health. It is not necessary to examine into the life of the dungeon convict, or the underground rooms of filth and squalid humanity of "Five Points," in New York city, to be convinced of the baneful influence of a life in shade, yet these aspects may assist in convincing the skeptic. Compare the buoyant, cheerful, spirited, ruddy faces of open air laborers with the pale, cadaverous, emaciated, sober, depressed countenances of those whose habitations deprive them of the influence of sunshine. Visit the collieries, badly lighted factories, workshops and underground printing establishments. Visit the narrow alleys, confined courts, and garrets of dense cities. Compare the statistics of mortality and conditions of health of hospital patients who live in north rooms, with those who live in rooms where the cheerful sunlight freely enters. It is a well-known fact, says Winslow, who quotes largely from Virchow, that the effect of isolation from the stimulus of light produces an alteration in healthy blood. The fibrin, albumen and red corpuscles become diminished in quantity and degenerated in quality, and the per cent. of the watery portion of the blood is increased. In such condition the tissues become soft and flabby, leading to prostration of the vital energies, with a tendency to pathological changes of the tissues; and in this state, also, the body is very susceptible to all endemic or epidemic diseases.

Exactly in what manner the sun's rays act upon animal life is not understood in all particulars and details, but, as Dr. Bryson remarks: "why, in a state of perfect repose, the blood should acquire a brighter tinge and an increased force of circulation, provokes inquiries, the importance of which

the observant physiologist will not fail to appreciate. It is evident that there is a physiological benefit to be derived from a proper degree of sufficiency of direct sun's rays, which is as necessary to the oxygenation and stimulation of the cutaneous circulation, *per se*, as the rendering of the atmosphere better fitted and the more exhilerating for the deeper circulation; for it is a well-known fact that, deprived of sunlight, the blood degenerates, while from sunlight the feeble and anæmic often return to health." Yet how frequently do we see dentists afflicted with tendencies to phthisis pulmonalis, continuing and persisting in the practice of actual worship, as it were, of the old idol "north light." The life-generating, invigorating, sustaining power of the sun's rays is no fanciful hypothesis; it is the law of nature, which causes all life to generate to its highest degree, but which if disregarded, often occasions diseases, which, though so insidious in their nature as, at first, to be unnoticable, are yet so terrible in their consequences, and so disastrous and fatal in their results, acting with as great if not greater certainty than any of the devastating epidemics which are the dread of mankind.

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Dr. Willard, in his address before the New York Legislature and the State Medical Society said, "We believe that neither pure air nor exercise alone will serve the purpose of keeping the organized machinery of the body in a perfectly healthy condition. Innumerable diseases, it is certain, are produced by the impurity of the one, and the neglect of the other; and it is just as certain that the absence of sunlight will originate diseases, or, at least, predispose the system to them, of as serious a character as in either of the other cases."

To see illustrated the demand of vegetable nature for sunlight, go to the forest and see the yearning of the trees for top light; see them seeking it oftentimes at the expense of leaning many degrees out of the perpendicular. Observe the true and steadfast sunflower, with its face, like the needle to the pole, following most sedulously the sun. Notice the garden pole vines, the beans, the hops, as they creep around their staff after his soothing rays, all facing the east at the rising of the "God of Day," and facing the west at his going down. Notice the ivy leaves, which, when forced out of their places, will twist upon their stems and face the light again. Go to the farmer's potato bin, in the back and darker portion of the cellar, late in spring, and see that beautiful effort to reach the light. See the thousands of silvery vines all shooting parallel and in the direction of the window, and not one of the number so imbecile as not to actually know, as it would seem, the proper and the shortest route. I have seen vines from stray potatoes in the

dark and dreary rear of the cellar, extend twenty to twenty-five feet along the bottom and up the wall, as if really inspired by the thought to look, as it were, out of the window, or some friendly and inviting hole through the underpinning.

Although it is sometimes said that air may be pure without the aid of sunlight, and although, so far as relates to freedom from poisonous contaminations of a zymotic nature, or even of any other impurities of an obnoxious character, this assertion may be true, yet the negation of the factor of a proper amount of sunlight through it during a large part of the time is an imperfection, which, in so far as it pertains to the well-being of animal health, is to me a sufficient reason for condemning the term.

It is a notable fact, patent to all, that the tables of mortality show that those who are constantly exposed to out-door occupations (even with all the injury resulting from over exercise and hard labor to which so many are subject), enjoy the best health, and generally live the longest. On the other hand, statistics show that the greatest mortality in the country is among those who live in dark or shady quarters excluded from sunlight, and in cities on the shady and dark side of the streets.

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That want of proper exercise, both physical and mental, is the cause of much stagnation and rust in the bodily machinery of the human race, is undoubtedly true, yet it is also as true that this degeneration is much more rapid when accompanied by a life in shade than in sunlight. It is also equally true that any degree of exercise in shade is not as beneficial as when taken in sunlight, for there is the want of a stimulating element in shade, which is supplied to the system by the actual rays of the sun, over and above what is imparted to the atmosphere.

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Who has not experienced a happy change of feeling when passing from a north room, with its dead, staring light, to a south room, beaming and gleaming as sweetly as the promise of friendship, or the mellowed glance from the eye of love?

In some places in Europe the opinion is current that sunlight is of so capital importance that places are established for the purpose of sun baths for children, who are there exposed, naked, to the sun's rays as they penetrate the ground glass. The ancients understood this when they built their "Solaria," or sun-bath terraces, on the tops of their houses. Dr. Longworthy

says, "the influence of the same number of degrees of artificial heat for the same length of time upon the skin does not produce the same benefit as from the direct rays of the sun." Fourcault cites an instance illustrative of the sad and deleterious influence of too much shade in the conditions of a certain Orphan Asylum, where the children were much afflicted with chronic diseases, and where scorbutic affections prevailed, which, however, were followed by a very favorable change after the removal of several large mulberry trees from the immediate surroundings.

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Probably there is no better evidence on record of the necessity of sunlight for the maintenance of health than can be shown by the extreme negative arguments; as from the experience of Dr. Kane, who, during two years in the north, passed two nights of more than two months each in total darkness. For one hundred and twenty-four days at a time, the sun was below the horizon, and one hundred and forty days, or nearly five months before its rays fell again upon the brig. In an atmosphere free from adulterations of malarious, pestiferous or noxious emanations, "with plenty of exercise of the most active character, plenty of time to rest and sleep, with the same quality of food as was used during the sunlight, they found that with increasing darkness there came increasing disease."

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Sir James Wylie, of the Imperial Russian Service, remarked to an English physician who was visiting with him the barracks at St. Petersburg, that "three cases of disease occurred on the shaded side, to one on the sunny side, although the apartments on both sides of the building communicated freely with each other, and the discipline and diet and treatment were in every respect the same."

Florence Nightingale says: "second only to fresh air I should be inclined to rank light in importance; not only daylight, but direct sunlight is necessary for the speedy recovery of the sick."

Baron Dupuytren, one of the older French surgeons, relates an account of the case of a lady in Paris who for several years was afflicted with a great complication of diseases which baffled all her medical advisers; and her case was pronounced hopeless, until he ordered her to be removed from her dark room and sent to another part of the city where she was put into more cheerful quarters; where, exposed as much as possible to light, she rapidly improved, and in time entirely recovered.

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Perhaps no better and more conclusive evidence of the influence of light can be given than that shown by the results of some experiments by Dr. W. F. Edwards, who placed some frog spawn in a vessel made impervious to light by being covered with dark paper, and another quantity in a box permeable by sunlight, but otherwise under the same circumstances, temperature, etc. Those in the light developed in their regular time and order, but none of those in the dark did well, though in a few eggs some unmistakable evidences of transformation were noticed. He further placed deep in the "Seine" twelve tadpoles in a tin box pierced with holes sufficient only to permit water to pass; only two underwent the regular development of the frog. These results were corroborated by experiments of Dr. Hammond.

Now as to the claims of northern-light advocates; we find two. First and foremost, they say, north light is steadiest; secondly, that north rooms are cooler in summer. Granted that north light is steadiest, and north rooms are cooler—this second claim can be offset by saying, if the north room is cooler in warm weather, it is correspondingly cooler in cold weather, and neither argument is worth considering. Dismissing this, let us direct our attention to this steadiness which we hear so much about. In the first place there is no such thing as steady daylight; it is only relative; a north light on a bright day, undoubtedly is an excellent light for most operations, but on dark days it is insufficient; and in case of some operations in the posterior part of a deep, dark mouth, even the *strongest* north light I think is insufficient—certainly so with me. North-light operators must be content to work in the scale from a minimum to a little above medium degree of intensity of light, while with the aid of the adjustable screens on sunlight windows, the operator works in any degree of intensity, from the medium light of cloudy weather to the maximum of the sun's rays. I can do much finer operations and with much less fatigue to my eyes, by the south light, when I can get the direct rays to fall on the point of my work, than by any other light.

While passing Waltham watch factory, one bright morning, I was struck with the cheerfulness of many of the operators, both men and girls, who appeared to be ruddy and very healthy. I afterwards was led to correspond with the treasurer of the company, Mr. Robbins, relative to the subject now under discussion; he informed me that he "believed the south light more wholesome; that though the operators generally prefer the north light on bright days, they like a strong light, to be directed upon

the *point of work*, whether it comes from north or south." "On the south side, screens and curtains are in common use to effect the general shading, while the full strength of the light is allowed to come upon the work through openings in them." Although as well done, Mr. Robbins says he "cannot say that better work is done on the north than on the south side."

In reply to similar queries sent to the National Watch Company, at Elgin, Illinois, I was informed that their "buildings are so situated that at sometime during the day the sunlight enters nearly all the windows; and the rooms are narrow, with high ceilings; and they never have noticed any difference in the work on account of sunlight." If watchmakers, who work on open tables, can do as fine work in sunlight, is it not more reasonable to believe dental operations in the dark oral cavity can be as well done when illuminated by the direct sun's rays.

In 1873 I had a bay window built on the north side of my office, eleven feet wide and five and a half feet deep, with very large north and west side windows and a skylight five feet square, affording as much light as can be well obtained from the north. Entering this bay in a high degree of health, after a vacation trip twice across the continent, consuming several months, and being closely confined to business during the day, (never at night,) seldom allowing sunlight to fall upon me, I found myself growing weak and very pale. At the end of the year I had a cough, which not only became in a measure chronic, but was steadily increasing, to such an extent that my acquaintances believed I had, or was passing into, phthisis pulmonalis. This weakness of the general system and close application in the operative department of our profession, was followed, after about a year, by a trouble in the eyes, causing pain in them when closely used in fine work, especially during cloudy weather.

Feeling that my health might be improved, I built another bay window, of the same dimensions and kind, on the south side of the house, with proper shift curtains, so that I could regulate the degree of intensity of the light, to suit the various operations, and always, when possible, permitting the sun's rays to pass through a space between the skylight curtains, so as to shine directly into the patient's mouth, (not in the eyes,) and occasionally upon myself, as I moved about, and before six months, under the same amount of labor and close confinement, I found my cough had left me, and my complexion had changed from a waxy, cadaverous whiteness to a look of vigorous, ruddy robustness, and my vision had become strong and endur-

ing, and, to my surprise, I found I could do a finer quality of work than ever before, and with much greater ease. After operating in this south bay-window eighteen months, I moved to Brooklyn, where, at an ordinary southern window I continued to experience the same benfit, though to a more limited extent. Anyone who has once operated in a large bay, knows how disadvantageous and inferior an ordinary window is to work by.

Finding it necessary to change my business location, I found myself working during several winter months by a west window, where, owing to tall houses near, the sun did not shine into my office for three months; my health again began to fail and my eyes troubled me so that I was obliged to abandon my evening studies for several weeks, in order to save them in proper condition for day work. As spring approached and the sun rose high enough to shine above the opposite houses, my health improved and my eyes became stronger until the spring foliage on the trees before the house cut off my light, when my eyes began to pain me again, when I changed my working place to an east light, the best I could command, which in the morning admitted the sun's rays, and my health and my eyes improved again; but no light is as good for me as the southern, and as soon as I can find a suitable house, I shall again work in the south light; for this experience satisfies me of the truth that "where there is sun there is thought, and cheerfulness, vigor, and strength."

If I could make it convenient for patients, and I could have just what I want, I would have my operating room in the top of some part of my house in the form of a skylight observatory, with side windows all around, where, with suitable curtains and shades and a chair in the center, I would always, when possible, face my patient so as to get the direct sun's rays upon the point of my work. Probably a more practical arrangement would be a very prominent bay window projected from the southwest corner of a block of buildings, so planned as to permit the sunlight to shine into it from morning until evening.

DISCUSSIONS.

DR. MCQUILLEN: The paper just read is an able one, and has gone so fully over the ground that there is very little left to be said. Twenty-four years ago I published a paper on "The management of light in the performance of dental operations," in which I took ground in favor of a northern light. I am now convinced of what my friend Dr. Townsend said to me, that it would do very well for a young man to talk about northern light, but the time will come when you will be in favor of the southern light—a strong light, modified by the use of a screen.

After being confined all day to the office, it is important, on going out, to walk in the sun; and, when not too hot, to seek the sunny side of the street, and not the shady side as is generally done. I arose to offer my thorough endorsement to this valuable paper.

DR. SPALDING: I desire to add my commendation of the general character and substance of the paper read. There is one experiment which was tried by Dr. Edwards, which, I think, bears strongly upon this subject. In his experiment upon tadpoles, he excluded certain subjects from the light, and, while they grew to an enormous size as tadpoles, they did not develop into frogs. In the course of his experiment it occurred to him that he might supply that defect in some other method than by the rays of light, and consequently he commenced feeding to the frogs, grass and other vegetable structures which contained chlorophyl, which is only formed by the direct or diffused action of rays of light. Plants grown in the absolute shade are without chlorophyl. The consequence was that on green food these identical tadpoles, while remaining in the dark, rapidly developed into frogs. That suggests the point that something may be supplied to dentists and others who are habitually in the shade, in the way of food, that would take the place of light. Hence it has been my habit for many years to live largely

upon green vegetables when they have been accessible. I operate by a northern light, but I doubt whether it is best to do so. I believe I have done considerable towards remedying that defect in the selection of food.

DR. WATERS: I operate by a northern light. I find that fruit has enabled me to feel a great deal better, have a clearer head and better eyesight, than when I lived on a mixed diet. I like those things that are developed in sunlight. Early in the spring I obtained some tadpoles and placed them in my office in a glass vessel, and fed them, and gave some to a friend, who placed them, also, in a glass globe, and used that glass globe to keep a bouquet in. While my tadpoles grew, as tadpoles, to a large size, and very rapidly, the other tadpoles, given to my friend, did not increase in size, but minute legs began to develop, and they became frogs in a few weeks. These were kept in sunlight; mine grew in the shade.

DR. REHWINKEL: If this paper were in print and in the hands of dental practitioners for distribution to their patients, it would be well. It reaches the whole community, and that part of it which ought to read and know it. In many families the sunlight is carefully excluded from parlor and hall, and too much so from living rooms and nursery. It seems to be a characteristic of American ladies, of finding great comfort in dark rooms from which the sunlight is banished. I believe if we were to distribute to mothers, this paper, impressing upon their minds the importance of reading it understandingly, we would not only benefit ourselves, but mankind in general.

I have operated for the last fifteen years by a northern light; prior to that, eight years by an eastern light, having the sun in the morning. A friend of mine, who has operated about three years by a southern light, told me the other day, that, taking everything into consideration, he liked it fully as well, and in some respects better than a northern light. As for this paper, it is of that character that I cannot argue against it. It is a subject upon which we are fully prepared to pronounce final conclusions. Nothing can be said against the arguments sustaining the writer's position; they are all good and forcible.

DR. THOMAS: As has been remarked, the paper has gone over almost the whole ground; but there is one point left out, that to me is very important. In one place the author makes this statement: "that people choose north rooms because they are cooler." That is a mistake. If you will observe in the heated terms, from which quarter we get the soft summer

breezes, you will find that they are almost invariably from the south. If you want to get a breeze in your house, go into a south room. In cold weather we get the blasts from the north, when we do not want them; but in warm weather we want a southern exposure in order to avail ourselves of the summer breezes, and in winter to secure all the sunlight possible.

I want to offer my hearty testimony in favor of the southern light, having for eight years operated in a full southern exposure, my office facing a large open square. When I went into the office, dentists who came in to see me would almost invariably speak of the light, asking how I could get on with the south light. They almost made me believe that I had made a very unwise choice. I availed myself of muslin curtains, hung from both top and bottom of the windows, and I very soon accommodated myself to the light; and the day was never so dark but that I could see my work very well. Two years ago I built an office and house together, and I put the office, I am sorry to say, in the north-east corner of the house. When we are in health we do not know what it is to be sick. I did not fully realize what a blessing sunlight was. I have now a light that comes from the north, and from the east, and a skylight. The skylight, in my opinion, is a failure. Cross lights are not desirable. If I could so arrange it again, that I could secure a south light, I certainly would do so. Don't be afraid of the sunlight.

Dr. Barker: There is a great deal involved in this subject of light. The question is not, as the paper would suggest, the influence of light upon an individual out of health, but it is whether a dentist can operate most beneficially to himself and his patrons at a north or south window. Everyone must admit that sunlight is imperatively necessary for the health and well-being of every individual, and particularly so if at all indisposed; hence it is not surprising that Florence Nightingale found that the wounded recovered more rapidly, and the mortality was less, on the south side of the hospital than on the north. In my judgment the paper presented, advanced one vital error; it states that individuals who live in the open air, and instances agriculturists, are the class that enjoy the best of health, and generally live the longest. It has been proved by statistics carefully prepared, that this very class are in the proportionate majority in our insane asylums, and hospitals; and mortality reports show that merchants and professional men, who pass but a small portion of time in the open air, are the longest lived and the most healthful. I do not think I am claiming too much when I assert that the combined testimony of all skilled artizans in delicate work-

manship, such as jewelers, engravers, artists and makers of mathematical instruments, is in favor of north light; and I have been told invariably by many such workers that their eyes were sure to be injured if they used, for a length of time, any other. The paper refers to one of the watch factories, where most of the work is done by machinery; in these each person performs one single branch of labor, and this is so constantly repeated that it becomes automatic, and hence demands but a small amount of mental and physical labor; this, however, is not the case in dental practice, for each operation, however slight, differs from every other, and calls for intense mental and bodily exertion.

The views presented by the essayist were in direct opposition to those which had been advocated by the majority of practicing dentists in the United States, and, unless excellent reasons to the contrary are advanced, the old opinions should still be adhered to. For myself, I can say that twenty years experience with north light enables me to speak in its commendation. I cannot understand, as suggested by the paper, how any one could possibly operate by sunlight, for rays of sunlight falling upon a bright surface like a gold filling, would be reflected, as from a mirror, to the eye of the operator, and most certainly interfere with, if not destroy, vision. It might be contended that by the use of window shades the rays of light would not be reflected as just described, but this was not what the paper advocated, for if I understood it, it took decided ground in favor of dental operations being performed by sunlight. A strong argument in favor of north light in contradistinction to that from any other point of the compass is, that the variations are decidedly less, and hence there is much less necessity for constantly regulating the focal distance of the eye, and less change in the iris and pupil, unvarying light favoring normal sensibility of the retina. I think that the dentist often injures his eyesight by having rays of light enter his operating room from more than one point of the compass, and it should, if possible, be avoided.

Dr. Kulp: Theorizing is often quite a different thing from practice. For many years I thought I could not operate with any but a north light. Being compelled to change my light to an east light, I did not like it as well as the north, and I aimed to get back to a north light again But for the last eighteen months I have been compelled to resort to a south light instead. For two years previous to that time it was necessary for me to wear spectacles on some occasions in operations, but since I have gone to the south light I have thrown my spectacles aside.

DR. BARKER: Do you think the south light cured your eyes?

DR. KULP: Yes sir, I certainly believe it had much to do with it. I prefer to have something green to rest my eyes upon, and for that reason I placed a flower stand in the corner of my room, containing a variety of plants, and when I am tired I rest my eyes on them, and I think that the rest I get on the green foliage, with the south light, has restored my eyesight.

DR. E. PALMER: As I value my life, I would not dare to shut myself out from the sunlight. Ten years ago I gave up my practice in the East on account of pulmonary difficulties, came West, and soon felt so nearly recovered that I again commenced the business, taking rooms with only a north light. In three months I was compelled to quit my office again for several months. When next I resumed business it was in rooms having a south and east light, and am convinced, beyond a doubt, that it has been due almost entirely to the influence of sunlight that I have been enabled to continue my practice constantly ever since. My laboratory is lighted by a skylight, and, if occupied there, I sit, when I can, where the direct rays of the sun fall upon me.

I heartily endorse the sentiments of the gentleman who has just spoken, in relation to the admission of sunlight into our houses. The blue light theory, if it fails to accomplish all its advocates claim for it, has been the means of throwing open the closed shutters of many a house, and, throughout our land, awakening an interest in, and a desire for, the healthful, cheering properties of this divinely appointed life-giving agent.

DR. A. W. FREEMAN: I worked for seven years by a northern light, became pale, and lacking in physical energy. I changed my office so that I operated at a large window on the south side of my house, and for the first six weeks I thought I should have to give up work by that light, as it was too strong for my eyes. But, having learned to adjust the light by a thin screen, I would not go back to a northern light for any money. Physically I soon felt better, and I know by experience that it is the best light for me to work by. I think pallid, nervous dentists, and those inclined to pulmonary troubles, will find the southern light a good tonic.

DR. ATKINSON: Gentlemen who have detailed experiences do not seem to be able to derive from them the instruction that is in them. We

have a thousand experiences every day, and an immense accumulation of facts, without being able to correlate them so as to indicate the principle upon which they are based.

My first criticism is, that Light is *light*, and when you come to differentiate it and take different modes of light, then you have to use an adjectival or adverbial form of phrase by which to designate the quality, or quantity, or character of the light. When we say that all life depends upon the sun's rays, we have simply announced a truism; but when we ask how certain kinds or modes of light manifest themselves, and learn that they are displayed more particularly under some deflection or prismatic effect upon the pencil of light by splitting it up into its actinic and its different colors, then we begin to get hold of the mode of motion that will enable us to comprehend why certain constitutions require a larger amount of light, and others a stronger degree of light. Those persons who have much pigment in their eyes, absorb a great deal of light, and can, like the eagle, "stare the sun in his face;" but those who are blonde, and have little pigment, will not be so able to bear the glare of the sun. These are very interesting principles.

It has been said that there is no chlorophyl in leaves not immediately exposed to the direct rays of the sun. The gentleman has forgotten that chlorophyl legitimately means the leaf substance, that is, the matter lying between the cells of vegetable tissue, and is not necessarily green. It was impliedly stated that the chlorophyl was able to catch and hold the sunlight, and so embody it as to introduce it into the pollywog's body through his digestory apparatus. He said there could be no chlorophyl without direct sunlight.

DR. SPALDING: Or diffused.

DR. ATKINSON: Then you could get it in the darkest hell, for there is some diffused sunlight there. It does not make so much difference how you get the sunlight within you, if you get it so as to appropriate that particular differentiation of the white light, or the sunbeam which ministers to the building up of the tissues; and this may be secured by reflected light, or by direct light. But remember that the direct light never comes into the human eye when you are looking upon an object that is within the reach of your fingers to touch. There is only one way you can get direct sunlight, and that is to look directly at the sun. Even if you look into the

looking glass which reflects ninety-nine per cent. of the rays, still it is reflected sunlight. But we make differentiations very crudely and coarsely, and we do not seem to comprehend what we are talking about, while we seem to think that our individual experience is the standard of all experiences. This is the only objection I have to the report: that the author has taken *his* position as *the* standpoint, and that there is no other. I think there have been more eyes injured by using too much light to see fine objects, than there ever have been by using too little light.

What is it that enables us to see at all? It is enough light to set in peculiar motion the rods and cones of Jacobson's membrane in the retina that forms the image, like the ground glass in the image plate of a camera; and when we have light enough to enable the image to be formed, then the consciousness behind the eye takes cognizance of that, and this is as various as the constitutions or organizations of individuals. Let it be said now and forever that truth does not wait the votes of anybody. Truth is truth, and all she asks is to be announced in understandable form, and not bolstered up by half-truths anywhere.

Our mistake is that we think an author, by being quoted voluminously, shall sway the eternal principles of verity. Away with such childishness. Let us come to our majority and be able to say yea or nay to every proposition. That is the great trouble with us in this great convocation—the "*senatus senatorum.*" We should forget these embryonal babblings, and come up to the comprehension of the principles involved, and let the details go, when they cannot be further utilized to illuminate our comprehension of the operations of the laws of our being.

DR. SPALDING: It was because I regard this body as the senate of the profession that I did not attempt to go into the principle involved in the development of chlorophyl. That is the reason I made my speech very brief.

DR. R. R. FREEMAN: We may not understand all the rules that regulate life, but we all recognize the fact that sunlight is necessary to health; but the question is, whether or not it is better to operate under a northern or a southern exposure. I had two years experience operating under a northern exposure, during which period I operated pleasantly at all times. For five years I have operated in a southern exposure, where I have the

sun pouring in until about two o'clock in the afternoon. In the morning I find that I operate with less satisfaction to myself, and I find that the reflection from the gold upon my eyes is painful. I may adjust my curtains and operate comfortably for a short time, but the clouds flit before me, and directly the sun is out, and then there are a thousand little mirrors that cause a reflection on my eyes which is injurious. In the afternoon when the sun goes away I can operate again. I also observe another point: when the direct rays of the sun are falling upon the face of my patient, my hand gets in the light, and I operate with much less facility and satisfaction to myself than when I have a northern light; and it is questionable with me whether it is not better to operate so that the sun may have some play upon you during the day for the benefit of your health. Dentists should recognize that principle, and they should not operate all day long in the shade, but should take sun baths; but when they want to operate pleasantly and agreeably, let it be in a light that is not flitting, that is not glaring; but a pleasant, modified northern light.

Dr. Judd: I wish to call the attention of the Association to the fact that in relation to this compilation in the paper in regard to sunlight and its influence in restoring health to the afflicted, and so forth, we are not, as many seem to suppose, for the first time throwing a great deal of light upon this subject. I wish to remark that these same views have been impressed upon the community at large for many years by the medical profession. It will have been noticed that nearly all of the experiments mentioned in that paper were made by medical men, and we must not for a moment suppose that we are about to broach something new, and impress it upon the world as our own discovery. It does not follow that it is necessary for a man to be in the sunlight all the time by any means. We have no statistics from any quarter that will justify any such doctrine. A certain amount of sunlight is necessary for the largest health, and it is our business to find out what is necessary for the highest enjoyment of life. I had no doubt, and if I had doubts before, I should have none now, after the testimony adduced by speakers here, that there are certain eyes better calculated to operate by a northern light than by a southern light, and there are eyes better formed to accommodate themselves to a southern light in their operations. After having tried a southern light, I had to return to a northern light, my eye being so constituted that it would not act kindly in a southern exposure. In settling this question each one of us must settle it for himself. (Applause.)

DR. MCQUILLEN: That which can benefit an invalid will do no injury to those who are well. The great advance in medicine in the past twenty-five years has not been due to excessive medication, but to the recognition of hygienic laws, and enforcing their observance upon the community.

Reference has been made to the fact that farmers, who are supposed to enjoy so much advantage from exposure to the sun, often become insane, while with professional men and merchants, who are confined to dark rooms, the ratio of insanity is very small. Prof. Barker certainly would not wish any one to draw the inference from his remarks that exposure to the sun is the reason why farmers become insane. The large ratio of insanity on the part of farmers has been justly attributed to the fact of their being cut off from the healthy stimulus of society, of having certain fixed work to do, and limited ideas for the mind to dwell upon; while on the other hand, the professional men and merchants have a variety of occupations for their minds.

Years ago arguments were presented in my paper in relation to the artist, the merchant, etc., that the northern light was of benefit because of its constant steadiness, and of its being from the pure blue sky; but the experience of twenty-five years with a northern light, and still using the northern light, convinces me that there is much force in the arguments in favor of the southern light.

DR. BARKER: I did not pretend that the cause of mortality, crime and disease among agriculturists was due principally to their being exposed to the sun's rays, nor do I think my remarks could be so construed; but the essayist had referred to this class as the one most favored in life and health.

The paper alludes extensively to the influence of sunlight upon persons who are diseased, and also to those who are engaged in occupations where the sun's rays cannot possibly enter, relating facts which no one will attempt to disprove. The reasons adduced are, however, no arguments for the dentist, for he need not confine himself to his operations so closely as to be deprived of sunlight; and any one so doing has no one to blame but himself if his health suffers.

Another point is in reference to the mortality that exists among the poor of large cities, where they are deprived of sunlight, and the children, if living, are apt to be sickly. This is only a part of the truth, for while it is a fact that we find mortality and sickness very great in such classes of society, it is not, as suggested by the paper, because they are alone deprived of sunlight, but is also due to the absence of all hygienic influences, as good food, good air, good drainage, and every condition that tends to promote health and long life.

REPORT OF THE COMMITTEE

ON

PATHOLOGY AND SURGERY.

By F. H. REHWINKEL.

Mr. President and fellow members of the American Dental Association:

Allow me to present for your consideration a few thoughts, more in the way of inquiries into the causes of, and conditions attending that formidable disease of the gums, root-membranes and alveolar processes, known as *Pyorrhœa Alveolaris.*

It is difficult to classify this disease properly. Some authors claim that it is a peculiar phase of chronic inflammation of the root-membrane, aggravated by constitutional causes; others, especially American writers, treat the affection as of local origin and as a diseased condition of the gums, induced by foreign deposits upon the necks of the teeth.

Upon a superficial view, it may seem strange that such a radical difference of opinion should exist among writers upon this subject.

Reflection, and a careful study of the varied conditions which diseased gums present, will prove the almost impossibility of exactly determining where to draw the line between constitutional and local origin. European and American writers also differ as to the seat of this disease, as well as to its nature.

According to Edward Albrecht, M. D., of Berlin, the author of a treatise on diseases of the root-membrane of the teeth, Soirac, a French physician, is entitled to the credit of being the first author who presented this affection in a special and distinct form.*

In describing the pathological conditions connected with this malady, Dr. Albrecht says: "The disease consists of a purulent suppuration of the gums, and has been classed with scorbutic affections. It appears at any age, most frequently, however, between that of thirty-five and fifty years; plethoric and fleshy persons, those inclined to fatty accumulations, are particularly predisposed. Both sexes are liable to its attacks, and especially women during the climateric years."

After citing the progress, also the accompanying symptoms of this disease, he enumerates the causes; among which, the following claim our special attention:

"Want of cleanliness of the mouth; accumulation of tartar upon the teeth. Damp and badly ventilated dwellings, and all those conditions which reduce the vitality of the body. Mercurialization, sudden suppression of habitual secretions. Metastase of skin diseases, Scrofula, Rheumatism."

The author then goes on to describe some of the peculiarities attendant on the disease, and lays before us a picture, with which we are all familiar. He further says:

"Although this affection may at times be purely local, in the majority of cases it is dependent upon constitutional conditions, and stands connected with certain periods of development at different times of life. In some cases it may cause the loss of all the teeth, though from six to ten years may elapse before this is accomplished. In other cases the progress of the disease is much more rapid; again, there is sometimes a sudden cessation of the symptoms, even when no medical or surgical treatment has been resorted to, and when purulent suppuration has taken place; and although the teeth will probably remain loosened in their sockets, further progress may be arrested for, perhaps, years;—when all former conditions may re-appear, and terminate in the loss of the teeth. In the majority of cases all symptoms disappear after the removal of those teeth from the sockets of which the exudation of pus has taken place, so that it would seem that these teeth were the sole cause of the disease; in consequence of which,

* Desirabode: Revue de Thera. Pointis. Journ des connaissances med. practiques, Septbr. 1841.

Fouchard and Jourdain looked upon this affection as a purely local one—the result of an effort of nature to throw off organs no longer possessing vitality. The removal of these teeth, however, insures no permanent relief."

Wedl's views correspond with those of Albrecht; he also classes this disease among inflammatory affections of the root-membrane, and corroborates some of Albrecht's views. He quotes the opinion of the above mentioned gentleman, that the pressure of the tongue and its constant sucking action upon the lingual surfaces of the alveolar processes, prevents the accumulation of the purulent matter, and that pressure by the finger upon the latter surfaces does not give vent to a puriform fluid, unless the affection is very far advanced. Wedl here admits that "in these cases, then, we have to do first of all, with a catarrhal inflammation of the gum, which afterwards extends to the root-membrane."

Salter, in his work on Dental Pathology and Surgery, does not mention this disease under the name of Pyorrhœa Alveolaris, but embraces it in his description of "False Scurvy, or Spongy Gums." Although he does not materially assist us in tracing the original seat of the trouble, he is very decided, however, as to its causes and character. He says: "The gum, the subjacent fibrous tissue, and the periosteum of the alveoli, are so continuous in structure, that they suffer together in this condition, and where the malady has been of long duration, the sockets become less rigid around the tooth-fangs, the edges of the bone become absorbed, and the teeth loosened. It is also attended by a considerable increase of the ooze which is secreted immediately around the teeth, and in some cases which are acute, this secretion is certainly purulent. Pus is readily formed on the surface of certain mucous membranes; but in the gum there is a special structure from which it appears to emanate."

"The causes of this malady are neither constant nor always intelligible. It is frequently associated with chronic dyspepsia and general ill-health. It also occurs very often in females who have had frequent pregnancies, and in both sexes it frequently seems to depend upon irregularities of the teeth; in some instances where they are crowded, and in others where they are much separated. Another frequent cause is mercurial action at some previous time of life. Patients may have taken mercury even to a slight degree, and the gums may have apparently entirely recovered themselves, when at a distant period, sometimes many years afterwards, spurious scurvy will arise and produce rapid absorption of the alveolar processes, and loosen the teeth."

The opinions of other prominent European practitioners, given in papers read before societies, or verbally, in discussions of diseased conditions of the gums, as a rule, admit that constitutional causes are mostly underlying this disease; very few, however, seem to think it is a matter of moment, more accurately to define this disease as a separate and special pathological condition. In fact, our literature is barren of any accurate description and definition of what I understand by alveolar pyorrhœa.

Our American authors represent this disease invariably as the sequence of local causes, and chiefly due to the deposit of salivary calculus on the necks of the teeth; and although they give general descriptions of the progress and peculiar features of this malady, they yet seem to ignore the idea that the disease may have existed for a considerable length of time, and may have become complicated with the added symptoms of spurious or false scurvy.

Dr. Ingersoll, of Keokuk, Iowa, in his excellent essay on "Diseased Gums," read before the Iowa State Society, May 2d, 1877,* makes an easy transition from "false scurvy" to pyorrhœa alveolaris and back to the former disease. We find in this essay a valuable and condensed treatise upon the anatomical structure of the gums, together with a rational account of morbid changes and diseased action pertaining thereto, and with most of the accompanying phases of "spurious scurvy." This paper is a valuable contribution to our literature.

Dr. Geo. A. Mills, of Baltimore, in writing on "What I know about Riggs' Disease (so called)," in the Feb., April and July Dental *Cosmos*, 1877, likewise gives us an interesting account of many of the peculiarities in diseases of the gums. These papers evince close observation and well digested thought, and give us true and interesting pictures of the morbid conditions which present themselves so frequently.

The author alludes to a resolution passed at a meeting of the Connecticut Valley Association, a few years since, giving credit to Dr. Riggs, of Hartford, for some originality, relative to new and special features in the pathology of the disease caused by, or connected with, deposits of salivary calculus in the oral cavity.

Dr. Mills proceeds to give some of the views of Dr. Riggs; also describing his treatment of the diseased gums and alveolar processes, which

* See *Dental Register*, June, 1877, Page 229.

views and treatment he fully endorses. Besides this, the author adds many interesting and valuable points, based in part upon his own observation, as well as upon the testimony of other writers.

These papers are the latest productions of prominent American practitioners, and although Dr. Mills, in describing his own case, admits that "the disease may have been at work for perhaps not less than twenty years, with a general healthy appearance of the tissues about the surfaces where the brush had been faithfully used, there was shown by the pressure of the thumb and finger on the buccal and lingual surfaces an exudation of pus from between the bicuspids and molars, and the treatment proved that there had been an extensive destruction of the osseous tissues in this territory," leaving us to infer that it was owing to purely local caues.

Dr. Mills' case of alveolar pyorrhœa, furnishes excellent proof of what I shall endeavor to establish, viz: That pyorrhœa may and does exist independently of foreign deposits, and that it does occur in the cleanest of mouths—and must for its origin depend upon other than mere local causes. I am sustained in this position by an account of an epidemic outbreak of alveolar pyorrhœa reported in the "Deutsche Vierteljahrschrift fur Zahnheilkunde," by Herr Zahnarzt, M. Schlenker, of St. Gallen, (Switzerland.)*

From this account it appears that in the month of May, 1876, a typhoid epidemic appeared in the city of St. Gallen; the origin of the disease was supposed to be contamination of the water by which the city was supplied, and which was used for culinary purposes. This epidemic lasted until the following autumn, despite all sanitary measures which could be adopted, and which were most vigorously applied. The disease was confined within the city limits, and Herr Schlenker states that he and his wife, both of whom had good teeth, were with many others, attacked by gingivitic blennorrhœa. He tells us that this singular feature aroused an intense interest in himself, and he set to work to ascertain if possible, whether this disease was connected with the epidemic. He cites quite a number of cases, and gives a complete symptomatology; all the different phases and expressions of the disease are represented, from the simple tenderness of tooth and gum, to enormous swellings and spongy growth. In some cases the attacks were very sudden, and within twenty-four hours the disease was fully established. In the case of a woman, the gums were inflamed and swollen only where the teeth had been lost and where the

*See Vol. XVII. No. 1, Jan., 1877.

plate of artificial substitutes rested. In another case the whole oral cavity was much inflamed, and the gums very much swollen and exceedingly painful; this person had lost all the natural teeth and had never worn artificial dentures. Herr Schlenker examined some of the teeth lost, and found the root to be either partially or entirely bereft of periosteum. He subjected the secreted matter to the microscope, and was astonished to find, instead of the expected pus corpuscles, a "little world" of living things,—leptothrix, matrix, oidium albicans, different kinds of bacteria, etc., etc. He says: "In all cases presented to me, the secreted, light-grayish matter was subjected to microscopic examination, and I invariably found the vegetable parasites in enormous quantities and strongly developed, particularly the bacteria. Pus corpuscles were not present." "The absence of the latter may possibly be explained by the fact that they were consumed by the parasites as food."

He then draws the conclusion that the presence of these parasites was the cause of the inflammation of the root-membrane. Having as he believed, discovered the cause of the disease, and as he was experimenting with salicylic acid, he concluded to try a concentrated solution in his own case. He applied it by means of a small camels-hair pencil to the bucoal surface of all the front teeth. The effect produced was a burning, drawing pain at the place of contact; in one hour afterwards, the mucous membrane could have been lifted off from the gums, notwithstanding the mouth had been rinsed with water immediately after the application. He did not continue this experiment any further; the case remained *in statu quo*, without further treatment, and finally with the disappearance of the typhoid epidemic, the blennorrhœa also took its departure.

In the case of his wife, a mouth-wash with salicyic acid was used for a period of four weeks without producing any change, either for better or worse In July she went to another part of the country and used the waters of Sideris, Canton Graubuenden (Isenseuerling chalybeate waters), which, together with the atmosphere, extraordinarily rich in ozone from pine forests there, banished every trace of the disease in four days.

The author then goes on to say that an alcoholic solution of thymol 1:100, proved the best remedial agent in the disease, freely applied by means of a small hair pencil, so that the fluid could reach every part of the gum and socket; repeated every two hours. After every meal the mouth was thorougly rinsed with water; and particles of food were wiped away from the pockets formed by the loose gums about and between the teeth,

with soft cloths; after which an astringent mouth-wash, to which thymol had been added, was used. Under this treatment, cases in which the teeth had become very loose, are reported cured within a few days.

In the July number, 1875, Deutsche Vierteljahrsschrift fur Zahnheilkunde, Page 305, a case of alveolar pyorrhœa is reported by Herr Friderich Schneider, Hofzahnarzt, Sondershausen. The patient, a young lady of eighteen, otherwise healthy, free from scrofulous or tubercular diathesis, had been under the treatment of several physicians for a considerable length of time without receiving any benefit. The case had so far progressed that the teeth had become loose, and purulent matter was oozing out from the sockets in considerable quantities. (Let it be borne in mind that this case was not in consequence of accumulation of tartar; nothing of the kind.) In looking for causes, Herr Schneider found that this young woman, eighteen years old, with perfectly developed physique, had never menstruated, and he suspected that the congested state of the gums, the subsequent inflammation and all other morbid action, was in consequence of this abnormal condition. The extraction of two of the lower bicuspids and a lateral incisor of the upper jaw, although the teeth were quite loose and with but slight attachment, produced such violent and persistent hemorrhage, that plugging the sockets became necessary.

The treatment in this case consisted of local applications and suitable hygienic measures, together with such medicaments as would act upon the uterus, and conduce to the appearance of the menses. The local treatment somewhat checked the progress of the disease, and, when after three months, the first menstruation took place and was afterward regularly established, the disease disappeared, and the remaining teeth became firm and useful.

I could also cite many cases in which the origin of the disease must be traced to the action of mercury, and in which this evil had existed for a long period; there having been no deposits of calculus; and where the disease fluctuated for years between improvement and relapse, until finally, the patients becoming discouraged, quietly submit to the gradual loss of their teeth.

In other constitutional diatheses, especially syphilitic, a tendency will frequently be found to alveolar pyorrhœa. Not less is it true that a predisposition to this kind of affection is found as an inherited family peculiarity. I have a number of cases in my mind where this is so manifestly plain, that there is no room for doubt. One case is particularly striking.

A gentleman, a resident of the state of Missouri, formerly of Chillicothe, who was possessed of, I believe, the soundest, most splendidly developed and altogether as fine a set of teeth as ever I saw, consulted with me from time to time during the last fifteen years in regard to his teeth and as to the best means of their preservation. The teeth were perfectly sound, the gums healthy, kept scrupulously clean, and the whole man a perfect picture of health. Notwithstanding all this, he seemed to actually suffer from some undefined dread in reference to the state of his teeth. This seemed to me entirely unaccountable; he told me that either his father or mother, I am not sure which, had lost his or her teeth, not from decay, but from their getting loose and dropping out. He therefore was determined to do everything in his power to preserve his own. Up to the last six or seven years, when I last saw him, there was no trace of the disease. I have recently learned from a professional friend in St. Louis who had been consulted by him, that the disease had become established in his mouth. I do not know the state of the case at this date. I mention it as being extraordinary. If care and attention had availed anything, I am sure he would have escaped.

Again, I have had the opportunity during my twenty-five years practice, of observing this inherited tendency among families who have been my patients ever since I have been in practice. I have had occasion to see the commencement and gradual progress of the disease, together with the later accompaniment of deposits of tartar, and also most of the phases under which it presents itself. I am fully convinced that there are other constitutional causes, which I refrain from enumerating, as it would extend this paper beyond reasonable limits.

There is one feature of this disease which is not only remarkable, but also very lamentable. I believe in the majority of cases which occur sporadically—the best class of teeth, those possessing the greatest density, of faultless development and excellently well cared for, seem to be those most usually attacked.

There is a great deal said and written about the necessity of the most thorough removal of the deposits of "tartar" from the roots. Are the granular deposits found on and about the crusta petrosa real salivary calculus? Has any one ever investigated this subject? Dr. H. S. Chase, of St. Louis, in his excellent paper on "Alveolar Periostitis," presented at this Association at the session of 1873, says, among other things, (Page 72, Proceedings 1873), "The interesting phenomena of the incrustation of the roots, repeated

every few days, until the reparative process was set up, is easily explained, being only a deposition from the albuminous discharge, which was *supersaturated* with sodic chloride, the salt being abundantly found in all protoplasms ready to undergo synthetic transformations. Moreover, this patient was a great consumer of salt as a condiment with her food." *

"No thinking person, I am sure, would confound this incrustation on the root with ordinary tartar; but it is analagous, though not the same in chemical composition, to the incrustation found on the ends of those which have been extracted where this disease has been local; only one or two teeth having become sore and loose."

In examinations made by Schlenker, he observed an entire destruction of the periosteum; and, again, in teeth which had yet retained some hold in the socket, this membrane was in some spots hyperæmic, and covered by new osseous deposits.

There certainly are some mysterious phenomena attending this disease which are not as fully understood as they should be. Individual observations and opinions, singly, can have but little weight; collectively they may become valuable aids in arriving at correct conclusions.

It would be both interesting and instructive if statistics could be collected from different parts of the world concerning the peculiarities of this disease.

Ireland and Scotland, whose inhabitants have the "best teeth," as is generally admitted, could, I think, furnish interesting information on this subject. I believe that if this Association were to address the profession of England, Ireland and Scotland, as well as France, Germany, Switzerland and Holland, asking for accounts and observations, an interesting chapter of Dental Pathology might be compiled therefrom.

What is understood by "Riggs' Disease," and why has it received this name? In order to enable me to give a satisfactory answer to this question, and also to learn the views of Dr. Riggs concerning this disease, as to whether he regarded it as of local or constitutional origin, I addressed a letter to him on this subject some six or seven weeks since, stating my object, and pointed the above questions; informing him that my search through

* A fact often observed in connection with this disease.—R.

our literature for something from his own pen had been in vain, and asking him to please point out to me where I could procure papers or reports written or made by himself, in order to embrace them, in part, in this paper. This request (made politely), has received neither reply nor notice. We must, therefore, rely upon the friends of Dr. Riggs, if there are any present, for answers to the above queries. Again, what are the new and special pathological features discovered by Dr. Riggs? From the statements of other writers we infer Dr. Riggs' opinion to be this: that there is necrosis of the alveolar borders, and that excision of the necrosed portions down to and beyond the line of demarkation between the diseased and healthy bony tissue, is the only radical cure for "Riggs' Disease." As the Doctor chooses to remain silent, and the above is an inference merely, it would scarcely be just to attack or criticise this theory.

It is a matter of some importance, however, to the dental profession of America, to more fully understand Riggs' theory, together with his method of practice, and particularly the pathological characteristics of "Riggs' Disease." Can Dr. Riggs be induced to let his light shine through some of our journals? Even a reprint of the paper read, or his remarks before the Connecticut Valley Association, would be welcomed by those who have had no access to the proceedings of the above named society.

As to the best treatment of alveolar pyorrhœa, the case reported to this body by Dr. H. S. Chase, of St. Louis, before alluded to in this article, offers a rational and effective mode of treatment; the main points of which have often been verified in my own practice. With this, or a substantially similar treatment, I should expect not only to benefit my patients, but in some mild cases, even hope to establish a permanent cure.

DISCUSSIONS.

DR. RAWLS: I have listened attentively, and, I assure you, with much interest, to the paper just read; and I believe the subject merits more consideration than has heretofore been bestowed upon it We see many patients afflicted with this disease that cannot be permanently cured by any of the present modes of treatment. It is true, however, that the disease may be held in check for a time by removing all deposits of foreign matter about the neck and roots of such teeth, and, if necessary, cutting away portions of the alveolar border when it is denuded of its periostial covering. But even this will only effect a temporary cessation of the forces which will ultimately result in a loss of all the teeth.

The disease attacks not only single individuals of a family, but entire families, extending almost invariably through several generations; and in view of this we would naturally infer that it is not a local disease, or caused by local irritants, but on the contrary, a purely constitutional malady intensified by local agencies. In some instances only one or two teeth are affected, and it may be altogether on one surface of the teeth; this would indicate to a careless observer that the trouble arose from foreign irritants, yet by watching those cases you will find that it does not stop there. As the paper indicates, it may indeed cease its ravages for a year or two, possibly ten years, and then pursue its course with more rapidity than before. The disease is undoubtedly aggravated by the deposition of lime salts, foul secretions or fouler excretions about the teeth and their roots. Of course such irritants should be removed under any circumstances, and most certainly when existing in connection with this peculiar disease. It has been termed Riggs' Disease. Now while I do not wish to reflect upon Dr. Riggs, yet I am sorry he put himself on record as he is reported to have done.

DR. ATKINSON: Where has Dr. Riggs put himself upon record?

DR. RAWLS: Before the Connecticut Valley Dental Association he is reported to have made this remark: That for want of a better name he would call it the Riggs Disease. I do not presume that any one will object, certainly I will not, to the Doctor's laying claim to the honor of his peculiar mode of treating such cases; but as to the discovery of this disease as a peculiar disease, it has been brought to the notice of the profession under different names many times, and probably years before he entered the profession.

You will find that some patients whose families have suffered and lost their teeth by this malady, have early premonitions of coming trouble; they insist that they are not likely to retain their teeth long, since so many members of their family have lost their's by this disease; and consequently try to take the best of care of them in order that they may put off the evil day as long as possible. I have under my care the teeth of a family of ten children, and I have examined the teeth of very many more of their relatives, and not one of the number is free from the effects or symptoms of this disease. Many of them have undergone treatment, but none, so far, have been permanently cured.

Dr. Riggs, as I understand him, claims that the disease arises from deposits of lime salts, and other foreign substances, about the roots of the teeth affected, and that these deposits cause denuding of the periosteum, and necrosis of the alveolar border. That these things do occur sometimes, I admit, but that they occur as the primary cause of this Pyorrhœa Alveolaris, as Dr. Rehwinkel terms it, I doubt very much, but agree with the paper that it is a local expression of constitutional disease, and only aggravated by deposits of foreign matter about the teeth.

DR. SHEPARD: I am not quite ready to say anything on this subject, and had intended to wait till others had spoken, but I have listened to so much of misrepresentation, founded, I am convinced, upon nothing but hearsay evidence, and perhaps prejudice, that I cannot longer refrain from the attempt, at least, to defend my absent friend, Dr. Riggs, from unjust accusation. That he has himself asserted that he called the disease under discussion Riggs' Disease, is, I think, totally without foundation in fact.

DR. RAWLS: Do you mean to say that I have no foundation for the statement?

DR. SHEPARD: I say without any foundation from himself. That he may have said it in some other part of the country, when I was not present, I cannot, of course, deny, but that he said it in the Connecticut Valley Society, I do deny; and I should be correctly informed, for I edited its Records, recently published, of the thirteen years since its organization in 1863, and have been a constant attendant of its meetings. During an intimate acquaintance of fourteen years I have never heard him give utterance to anything that could bear any such interpretation. That the name Riggs' Disease has obtained with some universality in this country is due to the friends of Dr. Riggs, to his disciples, who have given it that name for the want of a better.

In discussing this subject I hesitate to express my full convictions. Probably each one here feels that he has understood this disease, or, at least, has treated it in the best manner. Such a view is natural, especially in our more successful and leading men. I ask you to throw aside this egotism and allow me to make the assertion that, apart from the theory and treatment of Dr. Riggs, and prior to his commencement and demonstration of them, this disease was not understood nor thoroughly and successfully treated by any dentist in the land, and that the same is true at this day so far as the great majority of the profession is concerned. It was and is treated in a manner, but not in a thorough manner, nor to the extent of a radical cure. I know something about Dr. Riggs' theory and treatment, have seen many of his cases before and after operation, and have myself had a good deal of practical experience in following his method, but I cannot hope without proper time, to be able to express myself so accurately as to escape criticism. The essayist's experience in trying to get information from Dr. Riggs does not surprise me, for I know how peculiar he is, and how difficult it is to get him to put into writing his thoughts. But I will try and give you some insight into his views as I have had them time and again from his lips.

He considers the disease to be mainly the result of a local cause, namely: the accretion upon the surface of the teeth, at their necks, and just under the free margin of the gums. What is the origin of this accretion and whence it comes, is a matter of some doubt. Certain it is that it differs from ordinary salivary calculus in that it is found not only on the buccal surfaces of the superior molars and bicuspids, and the lingual surfaces of the inferior incisors, but on all the surfaces, labial, palatal, etc., of all the teeth, (regions remote from the mouths of the salivary ducts), and frequently on these latter surfaces without any on the former. That there

may be and probably are causes which are constitutional, he does not deny. He recognizes, or I do decidedly, that the disease is hereditary in many cases. I have two patients, father and son, where the former, about forty or forty-five years of age, had suffered so far as to have had several sound teeth drop out, and all the remaining were loose and sore, with abundance of pus before treatment; and the latter, about twenty-one years of age, had the disease to a less extent, though a thoroughly marked case. (The treatment of the former three years ago, has resulted in a radical and permanent cure.)

He considers that all cases, however advanced, were primarily of the simple nature of that of the young man just mentioned; that this accretion, wherever it gets a lodgment, acts as a local irritant, inducing inflammation of the mucous membrane, a gradual ulceration and absorption of the alveolar process, first of the thin edge, with the production of pus, and so continuing, year after year, getting deeper and deeper, until finally all the bony support of the tooth is gone, the roots bathed, more or less, in pus, and held in place only by the soft tissues, by a sort of ligamentous, so to speak, attachment. The amount of the pus secreted is sometimes very great, as is shown by the fact, that, in extreme cases, it is voided at night during sleep, upon the pillow, to the extent even of a spot the size of one's hand, while during the waking hours, when stimulated by the action of the mouth in talking, mastication, etc., it must be very much greater; that the patient during the day is constantly taking this pus and blood, mixed with the food and saliva, into the stomach, where it produces a serious disturbance of gastric function, with loss of appetite, indigestion, and extreme dyspepsia, resulting in emaciation and loss of general systemic tone, with decided blood poisoning, to the extent, as I have seen it, of purpura upon the breast. From this description it will be seen that Dr. Riggs regards the disease as mainly local in its cause, but that it becomes, in its progress, both local and constitutional.

The general treatment has been by physicians by medication, systemic and with lotions, and by dentists by both medication and the removal, less thoroughly than by Dr. Riggs, I think, of the local irritant. It is contended that two facts have been demonstrated by Dr. Riggs to the satisfaction of those who have watched him for years; first, that medication without surgery, or the complete and thorough removal of the accretion, cannot effect a cure; and, second, that surgery alone, or the thorough removal of the accretion,

or exciting cause, with absolutely no medication, will effect a cure of the disease, arresting the secretion of pus, securing a healthy and firm mucous membrane, the tightening of the teeth, or those not too far robbed of their support, and a recovery from all constitutional sequelæ by the natural processes of a renewed appetite, digestion, assimilation, etc., resulting from the absence of the gastric disturbing pus; or in other words, he has demonstrated that a radical cure is dependent upon surgical treatment, and that medication is only of use as an adjunct to the surgical treatment as a stimulant to rapid recovery, or to render the mouth more pleasant to the patient.

DR. REHWINKEL: Has Dr. Shepard ever seen a case where all these symptoms were cured without medical interference, and with no recurrence of the disease?

DR. SHEPARD: I can only go back to 1865 in my observations of this treatment, so far as that observation extends. I can produce living witnesses of cures effected without medical interference, and with no recurrence of the disease. I will only mention one case. In August, 1872, a gentleman, a merchant in one of our large cities, temporarily in Boston, who had been a patient of one of the most distinguished dental pathologists in the country, was sent to me for the extracton of an aching tooth. He had been for months incapacitated for business, and under medical treatment, without receiving any benefit, and was quite despondent. Upon examination of his mouth I found he was suffering from this disease in an aggravated form, and surprised him by describing his symptoms—the stain upon the pillow, purpura, etc.—without any questions. His disease was so far progressed that I hesitated to operate, and prevailed upon him to go to Dr. Riggs, which he did. After the treatment, taking two days, he went home; his appetite soon returned, his spirits revived, and in six months he was a well man, walking the streets, and attending to his business, and has continued so ever since, with no recurrence of the disease. There was no constitutional treatment, only a thorough surgical removal of the deposit. I do not claim that there are no constitutional affections of the gums; the subject is a broad one, due to other causes, for the cure of which medical interference may be effectual, and with no surgical treatment. We are considering now only this one manifestation, which the essayist has treated of, and which has in some quarters taken the name of Riggs' Disease.

That Dr. Riggs discovered the disease is claimed by no one; or that

he has published such a thorough and scientific description of its origin and pathology as to have his name applied to the disease, is not claimed; but it is claimed that he has originated and publicly demonstrated a treatment for the disease, which many consider so great an advance upon other and former methods, as to have rendered it within the power of our profession to effect a radical cure to an otherwise incurable disease. So if we would be accurate we should say Riggs' treatment of a disease. But the fact still remains that throughout the length and breadth of the land the disease itself was so little thought of, so poorly observed and so poorly described, that there was little known on the subject, and that Dr. Riggs was the first, and almost the only man for years, that stimulated the profession to investigate it. This fact gives him, I think, credit not only for his instruments and his treatment, but credit for the disease itself to a greater extent than would be due if it was not for this fact. And this is the reason why those of us who have been familiar with him and his "one idea" for so many years, who have practiced the treatment and seen its wonderful results, have called this disease Riggs' Disease.

Dr. Corydon Palmer: It is painful to me to see the time of this intelligent body wasted upon this subject. There has been so much said about the wonderful Riggs' Disease. There is not an old practitioner here who will not say that one of the first principles he ever learned in dentistry was to remove salivary deposits from the teeth, in order to restore the gums to a healthy condition. There is not an old woman in the country but what knows that you should take the scurvy from off the teeth when it is discovered. But, Oh, the Riggs' disease! A Frenchman presented his little girl to me to have her mouth examined: "Oh, is it ze Riggs' dizee?" when there was nothing but a little deposit of salivary calculus. It differs only in degree, and it is easy to remove it by a surgical operation, and a cure will be effected. All honor to Dr. Riggs; but this bringing him into notice, with his instruments for the treatment, and giving him the whole credit for it, is too foolish. I don't know what you are thinking about. I don't know where you are. There is not one of you but can treat the Riggs' Disease successfully if you will do it. The trouble is that you wont do it. There is nothing to be done but to remove the foreign deposit which is getting up the irritation. Let gentlemen be more careful to treat the cases that come under their hands, and be thorough about it, and there will be no cause for making such a fuss about this disease—a thing that has been known since the earliest attempt at the practice of dentistry. I felt that I

could not let this opportunity pass without saying what I have said, because there has been too much valuable time wasted in talking about this thing, and too much fuss made about it.

DR. BARKER: I cannot agree with my friend, Dr. Palmer, that we are spending too much time on this subject, but do approve of a great deal that he has said, and am perfectly willing to give credit to Dr. Riggs for the instruments he has invented, and which can be used for the purpose designed, most effectively. I cannot with my friend on the right accord to Dr. Riggs no responsibility for permitting his friends to present his name in an objectionable manner, month after month, in the dental magazines, and give a title to a disease that he has no more right to than any dental practitioner.

This subject is one of vast importance, and we should not examine it from a strictly local standpoint; in the majority of cases presenting, absorption of the alveolar processes and retro-cession of the gums is due to the presence of tartar, or foreign matter lodged around the teeth, and the simple removal of the primary irritant will, in these cases, arrest the disease; but, in many others the local pathological condition is but the expression of a systemic disorder, and hence the removal of the tartar will give but partial relief, unless supplemented with alteratives and tonics, as iron, quinine, or agents of that character, the tendency of which is to invigorate digestion and promote healthy nutrition, the disease being more or less a simple expression of general mal-nutrition. It presents itself occasionally in the mouths of persons who are very careful of their teeth, and where we can find no traces of salivary deposit, and where alone systemic remedies and hygienic influences can be relied upon, but which, nevertheless, are generally ineffective, the disease being due to hereditary influences transmitted from one generation to another, which no medicine or treatment can control. In one such case in my practice I can remember where many different members of the family, both male and female, were losing their teeth by this disease, and all treatment seemed to be ineffective. The ordinary local treatment is to remove as perfectly as possible, with instruments, all salivary secretions or foreign substances there may be about the teeth, and at the same time introduce into the pocket of the gum, aromatic sulphuric acid, or, what is quite as effective, equal parts of saturated solution of tannin and aromatic sulphuric acid. The action of these topical remedies is twofold: first, it combines with any portion of tartar remaining, which instruments have not been able to remove, thus leaving the teeth clean and free from tartar: second, the preparation acts as a stimulant and astringent to the suppurating

surface of the pocket in the gum, changing the character of the purulent secretion, favoring a plasm-producing surface. Careful attention to this treatment will, in many, produce happy results. In the cases depending on hereditary transmission much good may be expected by the administration of the hypophosphate of lime in solution, particularly in those cases where the tendency to absorption of the alveolar processes is very marked.

I have not viewed this subject in its broadest aspect, and its increasing frequency seems to indicate that it is one of the results of civilization, in consequence of the non-use of the teeth, and the consequent suppression of motion of teeth in their sockets; and as a result nature takes this method of vindicating the universal law of retrograde metamorphosis expressed in atrophy of the alveolar processes, and consequent absorption of the gums. To overcome this tendency, and encourage, if possible, "*reversion to primates*," I urge my patrons, both young and old, to use hard food in their families, particularly the oat-meal cracker and dry toast. As an instance of the value of hard food, look at the Irish who come to this country with clean, healthy, sound teeth, nothwithstanding no use had been made of the tooth-brush; but after a short time in America, as a consequence of eating soft food, they suffer from dyspepsia, salivary deposits with dental caries, and absorption of the gums and alveolar processes, with loosening of the teeth.

DR. ATKINSON: I wish I had time to unravel this tangled net that has been presented before us, for tangled it is in the apprehension of the best enunciators that have been answering the questions put forth in the paper. It is in vain for us to talk about hereditary tendency, and tendency to disease, for all these terms simply mean generalization or groupings together of acts that we do not understand in their individual presentment, nor understand whether they are local or constitutional.

Pathology is so deep, so wide, that it requires a very close scrutiny, a strong mental stretch of attention, a very fine perception of the movement of the round of nutrition and de-nutrition, to understand it at all; and we have been so befogged by superficial investigation—and words have been so bedeviled that they may mean just anything that we please to saddle upon them.

What is this condition? It has been called "abscess," it has been called everything but the thing it is. Not one single man has said "ulcer;" and if we knew what ulceration was and the distinctive difference between

ulceration and abscessing, we should have the whole subject properly before us. What is the reason that it is hereditary? Who knows that? Those men who have followed the cases, claim to know it. Do they understand the significance of heredity? Do they know that it means longevity of the office of reproduction of the elements of the tissues to be replaced for a certain number of times, and then cease to be capable of being replaced? Do they know what I have nominated the "cirsoid line" about all ulceration and all abscessing? It means a general congestion of the capillaries that surround an ulcer or abscess; it is the red line between the healthy and the diseased action. Do they know that if it is not reduced to a healthy tone, or extirpated, you cannot prevent the ulceration going on indefinitely as long as the patient lives? I have had many cases; one that continued discharging pus at intervals for twenty-four years from the effects of devitalized pulp of the superior central incisor; the patient possessed a good constitution, and the case yielded readily to treatment, and has remained perfectly sound and healthy for ten or twelve years.

As to our beloved friend, John N. Riggs, to whom much credit has been given, and at whom, on the other hand, very much unjust criticism has been launched, if he did this before anybody else, he ought to have told it then. It is on record by your speaker of having done this same thing before he left Cleveland, Ohio, (1861), and before he knew Dr. Riggs, other than by reputation. I take the ground somewhat similar to Dr. Shepard; I do not think Dr. Riggs is chargeable with individually or willingly making the claim, but I do think that the charge made by Dr Barker is correct, that he was a little weak-backed in letting his friends say it; he ought to have stopped it as a professional man, as a man sporting an M. D., as a titled man in the profession.

What is the treatment of this disease? They say, "Remove the deposit, and that is sufficient." There is no such thing as exclusive local disease. How do you like that? Constitutional disease, constitutionally expressed in full measure, results in death. Therefore there can be no expression in a living patient cognizable by the very best diagnostician but local expression of constitutional degeneracy. If you understand what I say and appreciate the remark, that provides for the whole in these two forms of deterioration (constitutional and local), which have been presented to us as *one* form, and wholly attributable to salivary deposit. There is a running out of the line of the longevity of the tissues, but the utter nonsense of saying that ten years, and twenty years, and thirty years, are intervals at

which this shall occur at the same location, is apparent—it simply means local disturbance by which such results are brought about. Many times I have seen a chasm by the side of the root, with the alveolar process entirely gone, and the gum in a sort of hypertrophied condition, with the morbid tissue occupying the place where the alveolar plate was, and the gums standing up and looking nearly healthy, but a little congested and blue. If the pulp be living at the end of the root, and the tooth be sound, you need not do anything but clear all the foreign material out, and wash clean with warm salt water (at blood heat), then dry as well as you can, and fill the pocket with aromatic sulphuric acid, being careful not to let it spill over the sides. You are required to get the condition whereby you can secure a state analagous to the embryonic condition before you can ever get an alveolar process reproduced. Whenever you can get a pocket to hold the pabulum, you can have all the tissues of the alveolar border reproduced to the neck of the tooth. Suppose you can get a pocket, you can accomplish a complete cure—any man to the contrary notwithstanding.

Dr. McQuillen: I had the pleasure of meeting Dr. Riggs several years ago, and formed a high opinion of his personal worth and character. I never met with a more modest, unassuming, retiring man; and with regard to the criticism relative to his not taking part in our societies in former years, I have reason to believe it was largely due to his constitutional diffidence; yet at the same time I think he has allowed himself to be placed in a false position. I asked Dr. Rehwinkel why he did not put the clean cut question, he uttered in private to me, "Is Dr. Riggs entitled to the credit of discoving the disease, like Bright, for instance, in discovering 'Bright's Disease of the Kidneys,' or Dr. Rea Barton in the discovery of 'Barton's Fracture of the Radius'?" If that were so, he might be entitled to the credit of dicovering Riggs' Disease. Whether he claimed that himself, or permits his disciples to put the claim forward, he is only in the position in which a large number of the profession place themselves, or allow themselves to be placed. If a gentleman, for instance, invents a little instrument, a chisel, an excavator, or scaler, it is advertised as Dr. so and so's, or Prof. so and so's. Men aspire to a place in the history of the profession, and expect a certain degree of immortality on such a shallow basis as that. It is a vanity we should get rid of; or, at least, when indulging in it not blame others for doing the same thing. I have no disposition to enter into the consideration of the disease itself, as it has been so thoroughly discussed. There is a funous condition of the gum attendant upon this affection, and also due to other causes, which I have removed with the delicate lancet I hold up to

view. I do not want this to be called, however, McQuillen's Lancet. By passing it between incisors or bicuspids where there is a funous growth of the gum, the growth can be easily cut away. I offer it to you for what it is worth.

DR. REHWINKEL: I am afraid there is one point in the paper which has been overlooked. In my letter to Dr. Riggs I stated my object plainly: that I was a member of the Committee on Pathology (of the American Dental Association), and as such was preparing a paper treating of diseased conditions of the gums; that I had heard of a resolution of thanks being tendered to him (Dr. Riggs,) by the Connecticut Valley Association, expressive of his claims and merits in discovering peculiar pathological conditions which arose in the disease of the gums *in consequence of deposits of salivary calculus* around the necks of the teeth. I furthermore stated that I inferred from the writings of others that *he* looked upon this disease as of local origin; and he would oblige me by informing me where I could procure anything from his own pen upon this subject, or where I could obtain the Proceedings of the Connecticut Valley Association.

Dr. Mills wrote papers under the title, "What I know about Riggs' Disease (so called)." Now it is safe to suppose that Dr. Riggs knew of these papers; why, then, does he not come forward and define his position and set himself right? Why does he rely entirely upon his friends? I could not criticise, could not admit or deny anything, because I did not know how much he claimed; I do know, only, that some phase of disease of the gums is called by some of us "Riggs' Disease." If Dr. Riggs has discovered any new pathological features in diseases of the gums, we are anxious to know all about it. Then I shall certainly be one of the first to give him credit and thanks for it. It is a subject in which I am specially interested; about which I want to know a great deal more than I do now. I have seen a great deal of it; I have been bothered greatly about it. I have fought it for twenty years, and, it seems to me, without much success.

DR. SHEPARD: I have never heard Dr. Riggs call it anything except a species of scurvy of the gums.

DR. JUDD: I want to ask Dr. Rehwinkel if he can tell us where this designation of "pyorrhœa alveolaris" comes from.

DR. REHWINKEL: It is used to cover this special disease, and no other. This disease, according to my opinion, is a peculiar disease in and

of itself. The symptoms of scurvy of the gums may become mixed up with it, or it may originate in that. It may have a local origin, or it may have a constitutional origin. It is difficult to draw that line—to say whether it is of constitutional or of local origin—because the two blend into one another so, that it is hard to separate them and see where the starting point is.

DR. JUDD: I seldom listen to a discussion with more interest than I have to this; for the reason, perhaps, that when the discussion commenced, I was somewhat befogged and clouded—thought I was listening to a discussion upon a disease with which I was almost, if not totally unacquainted. In the first place, I took the word, or the two words that are at the head of the paper, and, in analyzing them in my mind, attempted to extract some solution from that source. Any one can see, without any effort at all, that the word pyorrhœa comes from the Greek words πυον pus, and ῥέω to flow, and it is used where we have a flow of pus; and that alveolaris comes from the Latin word *alveolus*, and signifies a cavity, and it is used generally with us, always when correctly used, to designate the hole in which the roots of the teeth are planted. I then asked myself the force of this adjective alveolaris as it is used here. I could see that, correctly speaking, it would only mean a flow of pus from the alveolar cavity. I could imagine that the man that first used it intended to spread it over the alveolar process, and that it has been used to designate that condition of disease in which there is a flow of pus from the alveolar cavity, or the alveolar process and the surrounding part. Now, if you take these words at what they mean etymologically, they might signify the flowing of pus from these vicinities; and we have, in the first place, an ulceration of the gums around the necks of the teeth, which is a very common disease, and which is productive of pus, and then this might be comprehended in this term. In children it is sometimes a very destructive disease; and I have seen cases which have gone on until they have resulted fatally. There is a flow of pus here, from the alveolar margin in this case. Then it would likewise cover that condition of disease which we have been accustomed to consider under the head of absorption of the alveolar processes, for I tell you there is a flow of pus in every one of these cases. You see cases of absorption of the alveolar process where to the naked eye you can see no discharge of pus whatever, yet if you place a little piece on a broach, pass it under the gum and rub it over a glass slide, you can see, under the microscope, the pus corpuscles without any difficulty at all. I have tried the experiment, and I have never seen a case in which I failed to bring out pus corpuscles.

Before we pick up a word that is to a considerable extent an exotic here, we had better make use, in describing what we want to describe, of old terms that we have been accustomed to; they are certainly more definite, belong more, in reality, to our language, and generally are more easily understood, and certainly are as useful for all purposes of explanation, as these foreign terms which have been brought into use for the description of this disease. If we do that, instead of bringing a term which could rightfully cover three or four different diseases, we should come down to an accumulation of tartarous deposits on the teeth. It has been almost always treated under this designation, and it certainly expresses the condition of things which we have in the commencement of the disease, and the fact that we have pyorrhœa afterwards is only an accidental matter. When the deposit first takes place, just beneath the margin of the gum there is no pyorrhœa at all. The pyorrhœa is a secondary consideration, and it is only such a result as we always have where we have an inflammation that goes on to the suppurative process. The disease is only a suppurative inflammation. It is true in many mouths there is much greater tendency to deposition of tartar on the teeth than in others. There is, in the first place, a difference in the amount of calcareous solution in the saliva; and then, again, there are conditions in the mouth which determine its deposition. I say these differ very greatly in different mouths and under different circumstances. There is no question about that at all; and there is no question but that, if this condition goes on, and this inflammatory action is continued, and this irritation kept up in the system, you may have constitutional disease of a very serious character; but that it differs from any other disease, any other inflammatory action of the same location, I deny; and I defy any one upon this floor, or anywhere else, to prove that it differs from any other inflammation.

DR. MCDONALD: I am neither a friend nor an enemy of Dr. Riggs. I met him in the city of Baltimore a year ago last March, and he described to me his process of treatment, his instruments and what he claimed the result was; and it was simply a surgical operation of removing thoroughly from not only the neck of the tooth, but from all parts of the roots of the tooth, the calcareous deposit. He claimed this deposit was the original cause of the discharge of pus, and when that was removed, ordinarily there would be a healthful action, and a deposit of bone-making material, and restoration of the socket. I understand that the probability is that he has been more thorough in his surgical operations than many of his co-laborers, and that is all that Dr. Riggs claims. He does not claim to have discovered

anything, only that he went down to the bottom of the disease, like a thorough surgeon. He did not claim any particular discovery, to me, with the exception that he had gotten up some very nicely adapted instruments which reach the disease at the lower stratum or at the apex of the root. I ordered a set which I have used from that time to this, with a great deal of satisfaction, and a good deal of success. I believe many of us fail, not only in the cure of that disease, but in many other diseases, because we are not thorough enough.

DR. JUDD: I want to say a word in regard to necrosis of the alveolar walls. In the first place we have been accustomed to speak of necrosis when applied to hard tissue, as the death of bone in mass, to distinguish it from that gradual death which we call caries of bone. This has been the common usage of the term among surgeons in this country from time immemorial, but I have noticed in the last six or eight years that in a good many instances in the German writers, I find them using this term where it relates to death of soft tissues, and I ask the question with regard to what Dr. Riggs meant by the term necrosis; whether he meant that it was a death of the alveolar process giving away in masses, or whether there was an ulceration of the bone, or a caries as Dr. Atkinson supposed, which is the same thing; that is, that caries of the osseous tissues corresponds precisely with the ulceration of the soft tissues. I throw out these words because it might possibly be that Dr. Riggs used this term according to the later German customs.

VOLUNTEER ESSAY.

The Potency of Alcohol to Cause Degeneracy of the Human Teeth.

By EDGAR PALMER.

Studying the influence of this agent only as it affects the organs with which we as a profession have to deal, I am placed upon the border land of a subject a knowledge of which requires a knowledge and explanation of many of those physiological and pathological phenomena which I am conscious of being unprepared to give with as much precision and fullness as I would like, and only expect that what I have to present shall serve as a preface or index to the volume which abler pens must supply.

The methods by which I will attempt to discuss this subject are, first, to prove that alcohol has nothing to do with the nourishment of the organism; second, that when habitually taken into the system as a beverage, or in any manner, to excess, it produces marked physical effects, deteriorating in its influence, and involving the dental organs.

The word *alcohol* I have used merely as a supplementary term to describe that powerful, subtle agent which is contained in all forms of spirituous drinks, and is potent for good or for evil in proportion to the amount of absolute spirit contained, avoiding any allusion to different forms or combinations, or any attempt to connect the mere physical consideration of my subject with any moral or other pathological features. I should

have liked to have dwelt at some length upon the intentional additions of poisonous agents to the alcohol of the various kinds of beverages and modern compounds, for the purpose of showing the increase of evils likely to arise from such introductions, but I leave them, and speak only of the action of the unadulterated spirit

The living animal body is constructed out of a few simple forms of matter which possess during life the power of motion. Whatever helps to maintain it in perfect order of construction, whatever enables it to move of its own mere will and motion, may be considered as nourishment. The one gives matter and mass; the other gives force and spirit to the mass. Organic chemistry has divided foods into two great classes: those which supply material or tissue, and those which supply heat or other variety of force. Gradually it was detected that the building foods all contained the element nitrogen as an essential part, and that the force-supplying foods are free of nitrogen, and are hydro-carbons—substances that will undergo combustion by oxidation and liberate force for the motive uses of the animal economy. So foods have been for a long time classified as nitrogenous or tissue-feeding, and as respiratory or heat producing; and, so far as I am aware, there is at present no important modification of this view. The nitrogenous foods exist in the animal body in the form of what is called colloidal matter—meaning a jelly-like or soft-solid substance. All the organic parts are constructed out of colloidal substance; every part, including the blood-vessels to their minutest ramifications, is composed of this colloidal material arranged in different forms and plans to suit the design of the part, whether it be a tube like an artery, a bundle of cross fibres like a muscle, or the delicate membranous envelopes and structures; even in the brain and nervous matter there is distributed a colloid. So might I sum up the various parts of the body, and say that all the active masses of structure are nitrogenous and colloidal. In combination with this active matter there are, however, two other material ingredients, viz.: water and saline substance. Upon its combination with water the activity of the colloid depends; upon the saline rests the various kinds of combination of the colloid with the water.

In the human teeth the gelatine is combined with a salt called the phosphate of lime, with carbonate of lime and other salts in much larger proportion than itself, so that in all parts these three material compounds make up the animal structures. Leaving out the consideration of the other animal product, viz.: fat, we have before us the constructive or building parts of the animal body. Excepting the water and salts, they all take

their specific quality from the nitrogen they contain. We know the source of them is the vegetable kingdom, that they are formed by nature in that kingdom, are transferred from the vegetable to the animal, and are not made by any natural process within the animal, and can therefore only be supplied from the one natural source.

Alcohol contains no nitrogen; it has *none* of the qualities of these structure-building foods; it is incapable of being transformed into any of them; it is, therefore, *not a constructive agent* in the building up of the body. Landing, therefore, on the basis of an assumption so derived, we are led to regard the use of such a fluid as alcohol under any of its disguises - except when limited by the skill and learning possessed by the physician—as something superadded to the necessities of life; producing, like chloroform or opium, very marked physical effects when taken into our systems, but which have nothing to do with the nourishment of the organism, or the sustainment of function in any organic part. What, then, is the inference? If alcohol is something foreign and unnecessary to organic life, may it not, when taken in excess, have the power of producing specific pathological phenomena, and which may be definitely traced in its action upon the vascular, nervous, and nutrient supply of the dental tissues, and causing deterioration of tooth structure? I will attempt to answer this question, first, by asserting that *alcohol produces physical deterioration by destroying the integrity of the colloidal matter of which the tissues are composed.* In whatever way alcohol is introduced into the system it enters the blood; and, I will presume that my hearers are quite as familiar as I am with the course it takes in its passage through the body from the time of its absorption to that of its elimination, and will simply mention, in this connection, this peculiarity respecting it when taken into the stomach to be absorbed there from the surface of the alimentary canal: unlike the liquids and foods which nature has provided, it cannot be absorbed until it undergoes a proper degree of dilution with water.

The late Dr. Austin in his researches and observations upon the primary action of alcohol remarks: "Alcohol when separated by an animal membrane from a watery fluid, like the blood, will not pass through the membrane until it has become charged to a given point of dilution with water. It is itself so greedy for water it will pick up from watery textures and deprive them of it, until by its saturation its power of reception is exhausted, after which it will diffuse into the current of circulating fluid." Hence the more we dilute alcohol before drinking, the quicker will it be absorbed, and the

less will be its action upon the blood corpucles by depriving them of the water that holds the fibrine, or the plastic colloidal matter in solution. I have explained that all the organic parts are constructed out of this colloidal material, including the blood vessels to their minutest ramifications, and, in order that these parts should be kept in their integrity in the midst of their diversity, the ultimate structure of which they are composed must be held in proper measure of construction with water. Disturb the relationship that should exist between the colloid and its combining water, and the character of the colloid is at once changed. The fact that the blood corpuscles perform the most important function in the process of nutrition, I need not dwell upon; they absorb, in great part, the oxygen which we inhale in breathing, and carry it to the extreme tissues of the body; they absorb, in great part, the carbonic acid gas which is produced in the combustion of the body in the extreme tissues, and bring that gas back to the lungs to be exchanged for oxygen there; in short, they are the vital instruments of the circulation. With all these parts of the blood, with the water, fibrine, albumen, salts, fatty matter and corpuscles, the alcohol comes in contact when it enters the blood, and if it be sufficient in quantity will modify its function and impede its current to an extent that organs however remote or obscure must feel its influence and succumb to its degenerating power.

These are the only points time will allow me to present relating to the physical action of alcohol upon the nutrient elements of the blood, and I pass to consider, second, its action upon membranous and nervous structures. All the vital organs, and the minutest structures of every organ, are enrolled and enveloped in those expansions of the animal body which anatomists call the membranes. Dislodge a healthy tooth from its socket, and you strip from it its membranous sheath, or the periosteum. Open and examine a healthy tooth and you will find the vascular structure which we call the "pulp" enveloped in what may seem three distinct membranes, and differing but little, save in the strong fibrous structure, from those which envelope the brain and spinal cord. In fact, it is but a vascular structure of colloidal membranes. All membranous matter is colloidal in its functional nature, and not merely mechanical as anatomists formerly held. It is true that the parts and organs are supported and held in their positions in the most perfect order by these membranous sheaths, pouches and coverings; but this is only a small part of their duties. The membranes are the filters of the body; in their absence there could be no building up of structure, no solidification of tissue, no organic mechanism. Passive themselves, they nevertheless separate all structures into their respective positions and adaptations.

When solid food is taken into the stomach it is first resolved in digestion into a soluble fluid before it can be absorbed; in the blood it is resolved into the fluid colloidal condition; in the solids it is laid down within the membranes into new structure, and when it has played its part it is digested again, so to speak, into a crystaloidal soluble substance, ready to be carried away and replaced by the addition of new matter; then it is dialysed or passed through the membranes into the blood and is disposed of in the excretions.

With this description of the important part these membranous structures play in the animal life, I trust I can convince you that the continued use of alcohol exerts upon them a direct perversion of action: First, by so determinately extracting the water from them as to produce in them a thickening and shrinking, and inactivity, which reduces their functional power. That they may work rapidly and equally they require at all times to be charged with water to saturation. If into contact with them, any agent is brought that deprives them of water, then is their work interfered with; they cease to separate the saline constituents properly, and if the evil that is thus started be allowed to continue, they contract upon their contained matter in whatever organ it may be situated, and condense it. Thus, if the delicate membranes which play so important a part in the structure of the dental organs, become condensed, or thickened, or loaded with foreign material, then they fail to allow the natural fluids to pass through them; nutrition is thus cut off, and as a result, there is either an accumulation of poisonous gas or fluid in a closed cavity, like an incipient alveolar abscess, or a contraction and wasting away of the substance of the colloidal membranes, and the life of a tooth so circumstanced, dies; dies as though slowly bled to death.

The modifying action of alcohol upon the corpuscles of the blood, is due also to the capacity of the spirit to extract water from them, and is accomplished in some instances by causing them to run too closely together, or to adhere in rolls; or it may change the round corpuscle into the oval form, or produce other changes, in proportion to the extent of its use, so great as to impair their function to absorb and fix gases, and when the aggregation of the cells is so great, other difficulties arise; for the cells united must pass less easily through the minute vessels of the general circulation, and impede the current, by which local injury is produced. From the distribution of blood in these minute vessels the structure of the dental organs derive their constituent parts. By a refined process of "selection of material," they are supplied with the elements out of which they are constructed and preserved.

Does any one say that the mechanism of the dental organs is so delicate and remote, and the vessels so small as to escape the influence which an undue amount of spirit may exert upon the more vital organs? No! I think it will be conceded that the minute and intermediate vessels of the human teeth are as intimately connected with the construction and with the function of the living matter of which the body is composed, as with any other organ or set of organs in the human body, and are under control of the same organic laws, have the same power of contraction or dilation, and vital force, as the vessels of larger organs, and are stimulated by the same special *nervous action.*

Man has, virtually, two nervous systems—the primary nervous chain and the added centers with their fibres. These two systems, though connected by their fibres in different parts, are yet distinctly separate, both anatomically and functionally. The primary nervous system is called the system of the organic vegetative or animal life, and governs all those motions which are purely involuntary. The centers of the brain and spinal cord, with their parts, are the centers of the motor and volitional and of the reasoning powers, or of those faculties which are under the influence of the will. All those minute blood vessels at the extremity of the circulation are under the control of the primary or organic nervous supply. Now, if from any cause, this organic nervous supply be cut off by interference with the organic nerve feeding that part, the vessels become paralyzed, or at least weakened, and assume a condition of undue tension or relaxation. Moreover, the delicate membranes which envelop and immediately surround the nervous cords, are acted upon more readily by the spirit than the coarser membranous textures of other parts, and thus a combined arrangment of evils affects the nervous matter. Troubles of this kind, consequent upon the perverted condition of the membranous covering of some dental nerve, are almost daily brought to the notice of the dentist; pain caused by an impingement upon a nerve by pressure within the sheath of the nerve, and which in nearly every case has its origin where a nerve is enclosed in a bony cavity.

In conclusion then, in view of what light even these brief and imperperfect researches have brought, I must ask you to believe that alcohol when taken into the system in dangerous excess, so enfeebles the powers of life, so modifies the character of both local and systemic disease, and so changes the action and operation of medical agents, that unless the practitioner of medicine or of dental surgery has thoroughly studied the tem-

perament and constitution of his patient, he is but partially qualified to render his patient any service, and must expect to reap disappointment and loss for his efforts.

But the object of this paper has been, not so much to point out the cause and effect of these phenomena as they may influence the daily practice, as to establish the more solemn fact bearing upon the causes which produce degeneracy of the human teeth. I believe the day not far distant when the wide-spread indulgence in the use of spirituous drinks, and its ravages upon the health and happiness of the people of this country shall be recognized by our profession as among the most alarming causes of transmitted disease affecting the dental organs.

Says an eminent writer: "Amongst the many inscrutable designs of nature, none is more manifest than this; that physical vice, like physical feature and physical virtue, descends in line." And true it is that both mental as well as physical aberrations, inflicted on man by his own act and deed, cannot fail to be transferred to those who descend from him.

Equally true is it that not one of the transmitted wrongs is more certainly passed on to those yet unborn than the wrongs which are inflicted by alcohol. Therefore, how can we expect to reach the acme of dental science without giving heed to these facts in our searchings after that physiological knowledge and thereapeutic light which is to lead the nations of the earth into that era of happiness and blessedness when the teeth of their people shall bear more the evidence of Divine creation than the workmanship of human hands—a millennial epoch when forceps shall have been "beaten into plowshares" and turnkeys into "pruning hooks," and our profession have need to wage war with disease no more.

DISCUSSIONS.

DR. ATKINSON: There is a difference of understanding between the author of the paper and myself as to the functions of the corpuscles as carriers of gases. I know of no gas that a red blood corpuscle carries, but one; hence, when we say gases, we are leading the unwary astray; the essayist is or I am in fault. Oxygen is a gas, and the red corpuscles do carry it by a sort of loose attachment that is hardly worthy the name of affinity—by a loose hanging to the blood corpuscles, and it shakes off gradually as it passes through the body of the vessel in the blood column, becoming dissolved in the serum or carried as gas without being dissolved, as free as oxygen, to the capillary system, where, by the laws of demand and supply, it escapes through the thin amorphous walls of the capillaries into the territory where it is used for purposes of nutrition; that purpose being a production of protoplasm; and combustion which generates the other gas, which is carbonic acid; which the gentleman asserts is taken up by these corpuscles and carried back—he did not say, but I infer that he meant—to the lungs to be exhaled. I ask the gentleman, upon what experiments he bases the statement that carbonic acid is carried by the corpuscles at all? My understanding of the process is, that it is dissolved in the serum as it escapes from the point where it is generated by the combustion of the nutrient act, and then flows as a soluble gas to the system of respiration peripheral or pneumic, that is upon the skin or in the lungs wherever respiration takes place, and thus is exhaled. If I am wrong, correct me. I ask it of you. If you keep still, I will take it for granted that you endorse what I say, but if you understand it differently, and are entitled to call that knowledge, communicate it to me—a hungry brother.

As to the argument with regard to the effect of alcohol, and to the saturation of alcohol in water: these are new ideas to me; I had always labored under the impression that alcohol and water combined in all propor-

tions absolutely—that one drop of alcohol in any body of water would be diffused throughout the entire body, even if it were the Pacific Ocean. If I am wrong in that, correct me; if not, mark one in the progress of apprehension of truth.

DR. BARKER: That is the usual acceptation of it.

DR. ATKINSON: One step further. The statement of the paper is, that alcohol is absolutely innutritious; that it is neither a heat-producing nor a tissue-producing body.

DR. PALMER: I did not say it was not heat-producing.

DR. ATKINSON: You say it was not used in the body.

DR. PALMER: Not as nourishment, but as heat-producing.

DR. ATKINSON: All right, I am after fair, square play, and if I misunderstood you, that is the way to get at it.

My next objection to the statement is, that alcohol does coagulate colloidal material. Colloidal material is only another name for what I call "embryonal mass"–"globular mass"–the protoplasmic nitrogenous substance. If the gentleman acknowledges that alcohol can be combusted in the body, then it is as essential as any other burning material; and if he says it is combusted, I would ask him how the burning is effected. What becomes of the carbon, hydrogen and oxygen that compose the alcohol? He says alcohol is a carbo-hydrate; now, if it were a carbo-hydrate, and that nomination were correct, there would be no O in it, it would be CH. Is there nothing more than CH in alcohol? Do you know of any fluid that has no O in it? That has no H_2O in it? Now the point is this: that the deterioration that is supposed to be transmissable from parent to offspring depends upon a sort of affinity subsisting between the alcohol and the colloidal mass whereby the dialysis or the endosmose and the exosmose activities are interfered with by coagulation of the colloidal mass. I would ask, what is the difference between this form of coagulation and that occurring under the nutrient act whereby the oxygenation produces the coagulation? And are you sure that this amount of thickening or curdling of the colloidal mass is not exactly indentical with that that occurs from the oxygenation of the fat which constitutes the basis of the cell (the vacuole)? And have you accounted for all the alcohol that was taken into the system, by any exam-

ination of the excretions of the system? If there is an act that is so nearly indentical with the act of nutrition, which is claimed here to be the result of imbibition of alcohol into the system, are we entitled to say that it is innutritious? If we push the point far enough we can see that a certain measure of alcohol might so curdle as to render this colloidal mass stiff, might interfere with the nutrient processes of the shedding and the replacement of cells. The whole of the secretions are simply the shedding, moulting of epithelium. Then, is not the assertion that alcohol is innutritious, placed somewhat in doubt, somewhat in jeopardy? If it is said that it is a stimulant as opium is, do we know how opium acts as a stimulant? What do we mean by stimulants? Do we mean a catalytic action? Do we mean simply the presence of the thing acting without loss of substance? What we understand by catalysis is the presence of a substance acting to produce a change in the neighboring molecular mass without loss of its own bodily presence.

DR. SPALDING: Without decomposition of itself, without any change in its chemical constituents?

DR. ATKINSON: Yes, without any loss I said, or any cognizable change, according to our present knowledge.

DR. SPALDING: You say loss; what I mean is to include any accretion as well as loss, that the relative proportion of the chemical constituents are not changed, either by addition or subtraction.

DR. ATKINSON: If it is exhaled at all, it is exhaled as pure alcohol, no doubt.

Now then, as to the argument as against the use of alcohol. I tell you I do not believe it. It is the excess of the use of anything that can become a constituent part of the system, that interferes with nutrition. If we had established the point, that the paper states as a fact, of saturation of alchohol and water, then that would be at least one of the legs of the stool of the argument, and we might have the other two put into it, and make it stand, but it topples a little; I cannot see it. The only argument against alcohol is its use in excess; that is the point. There is alcohol manufactured and used in every man's stomach.

DR. SPALDING: Every day?

DR. ATKINSON: Every meal he takes, *nolens volens.* These points are points that sometimes have to be dogmatically stated when we are in the very beginnings of the crepusclar stage of our apprehension—the nine days of our cat-ivity. We have not got the "membrana pupilaris" quite clear yet, which is over our understanding of the law of physiological activity. I wanted to make these statements for what they are worth in the estimation of every listener, for I tell you truth is not sustained or broken down by the vote of any man or body of men. Present the facts and let the juridical mind decide.

REPORT

OF THE

COMMITTEE ON CHEMISTRY.

By J. S. CASSIDY, Chairman.

The complicated nature of the reactions that take place by general decomposition of an organized substance, renders detection of individual compounds thus formed extremely difficult. This unfortunate condition especially obtains in the human oral cavity, where traces of nearly all kinds of vegetable and animal matter taken as food, triturated, insalivated, and mixed promiscuously, are continuously present, because continuously renewed, undergoing rapid chemical change, by both fermentation and putrefaction, and in such relatively small quantities as to deter the most patient experimenter from the labor of attempting any definite classification of such innumerable products.

Your committee, however, felt desirous of testing one or two kindred processes, in relation to their action on tooth bone, inasmuch as to these prolonged vicissitudes of change, the destruction of teeth by loss of substance is directly due. The generally, and we think properly, accepted theory of acids being the solvent in dental caries—whether they be formed by influences external to the immediate part affected, or by propagation within an existing cavity—afforded a suggestion as to the nature of some experiments that might be attempted on extracted teeth. Believing that acids, however destructive, taken into the mouth, either as food or medicine, do

not primarily cause cavities of decay, we ignored any effort to ascertain the effects produced by any of these well-known substances, and confined the experiments to more rational, though less pleasant, methods of procedure.

Two cases of teeth were arranged by imbedding the roots in a mixture of plaster and gutta-percha so as to represent the natural position of those organs in the mouth; each case contained two central and two lateral superior incisors, two cuspids, two bicuspids and two molars, selected indiscriminately, but all chosen because of comparative soundness; the molars being intact, having been extracted because of senile absorption of alveoli; the others more or less decayed, though not necrosed (i. e., not devitalized previous to extraction).

In order to supply a cheap, long continued and uniform temperature of about 90° F. to our experiments—as in all cases of so-called spontaneous decomposition of organic matter, a certain degree of heat is a necessary condition—we improvised a liquid thermal bath, consisting of a circular flat-bottomed glass dish partially filled with water, and into this was received two other vessels, also of glass, the latter to contain the reacting substances. Two bottles, the one containing water, and the other sulphuric acid, were placed in position and arranged so as to allow a slow dripping of each into the water beneath. The regular mixing of these two liquids in proper quantities, of course, gains the desired point of temperature; and after exhaustion, the diluted acid may be repeatedly economized, allowing for decrease of energy by occasional renewal of acid in full strength.

Before entering into further details, we will premise that inherent chemical change of organic matter consists of the different kinds of fermentation and putrefaction, and that these processes take place mainly through the influence of heat and moisture, differing in degree and product according to the nature of the bodies undergoing material loss of indentity. In the human mouth the most favorable circumstances are nearly always present for the propagation of molecular progress toward simpler forms. Particles of food, however minute, of animal or vegetable origin, always tend to degenerate into active definite compounds, some, at least, of which, are undoubtedly the immediate cause of certain varieties of decay in teeth. Fermentation generally ceases with the production of its typical acid, and, according to Dr. Geo. Watt, two *mineral* acids are formed by organic decomposition following the first steps of putrefactive change from dihydric sulphide and ammonia, viz.: sulphuric and nitric acids. Of the organic acids most capable of injuriously affecting teeth, and also most likely to be produced by fermen-

tation of vegetable food containing starch, we mention acetic and lactic acids; and to the development of these agents in contact with natural teeth we endeavored to apply our experiments.

Of the various agents by which acetous fermentation may be produced, we selected strong cider, to which was added a small quantity of malt; and for a lactous fermentative was mixed raw sugar, milk, water and putrid cheese, the latter substance being often renewed on account of caseous coagulation by the acid. These two mixtures were placed each in one of the two glass vessels already mentioned, and the two cases of teeth mounted as described, suspended in them so as to remain near the surface, inasmuch as at the surface the acids are developed. Both vessels were then loosely covered and immersed in the liquid bath, care being taken to shut off the sulphuric acid from any interference with the process.

The steps in acetous fermentation may be described in four stages: first, the conversion of the malt (or starch rendered soluble by the diastase present,) into glucose; second, change of glucose into alcohol and carbonic acid—the cider in the mixture answering to the second stage; third, production of aldehyde and water by oxidation of alcohol; and, fourth, oxidation of aldehyde into acetic acid. As represented by symbolic equation:

1st. $\overset{\text{Starch,}}{C_6 H_{10} O_5} + \overset{\text{Water,}}{H_2 O} = \overset{\text{Glucose,}}{C_6 H_{12} O_6}$

2d. $\overset{\text{Glucose,}}{C_6 H_{12} O_6} = \overset{\text{Alcohol,}}{2C_2 H_6 O} + \overset{\text{Carbonic Acid.}}{2CO_2}$

3d. $\overset{\text{Alcohol,}}{C_2 H_6 O} + O = \overset{\text{Aldehyde,}}{C_2 H_4 O} + \overset{\text{Water,}}{H_2 O}$

4th. $\overset{\text{Aldehyde,}}{C_2 H_4 O} + O = \overset{\text{Acetic Acid,}}{C_2 H_4 O_2}$

The reactions in ordinary lactous fermentation depend upon the particular kind of sugar and ferment employed. The change in some cases consisting of the assumption of the elements of water, and in others of the simple resolution of the saccharine molecule, thus:

$$\overset{\text{Milk-Sugar,}}{C_{12} H_{22} O_{11}} + \overset{\text{Water,}}{H_2 O} = \overset{\text{Lactic Acid,}}{4C_3 H_6 O_3}$$

$$\overset{\text{Glucose,}}{C_6 H_{12} O_6} = \overset{\text{Lactic Acid,}}{2C_3 H_6 O_3}$$

Not quite three months have elapsed since instituting the process; a rather lengthy period of time to devote to one experiment, but insufficient

to decide satisfactorily many points in regard to details of analogy in oral chemistry. Before exhaustion of the first supply of the acetous mixture, a greenish film encircled the teeth at the line bathed by the surface of the liquid. There was no solution of continuity visible on any of the teeth, but the dentine lining the existing cavities was considerably softened. No perceptible change on the enamel at the end of five weeks. About that time extracted a deciduous molar from a child æt. twelve years. Its buccal surface, grooved slightly by decay, was covered by the well-known greenish deposit so often found near the margin of the gums on the teeth of children. Two weeks influence of the process on this tooth showed decided evidences of disintegration, especially on the buccal surface. At the present time the crown is tunneled through, the solution following the previous point of decay, the external surface presenting irregular minute patches of softened enamel. The effect upon the enamel of the other teeth has been almost *nil*, indeed, entirely so, except at the necks of the two lateral incisors—where the air and liquid met—at which point there is some manifestation of superficial circular abrasion, sufficient however to safely warrant the opinion that all will ere long succumb to further trial.

In regard to the fact of these teeth offering so much resistance to the action of acetic acid thus developed, we must remember that this agent is almost incapable of dissolving calcium phosphate when organized, even in a dead tooth. Its affinity to lime salts is directed mainly, though mildly, towards the carbonate ($\underset{\text{Calcium Carbonate,}}{Ca\,CO_3} + \underset{\text{Acetic Acid,}}{2C_2\,H_4\,O_2} = \underset{\text{Calcium Acetate,}}{Ca\,(C_2\,H_3\,O_2)_2} + H_2\,O + CO^2$), but it dissolves gelatine and kindred substances with avidity; a property which doubtless explains its relatively rapid operation on the recently extracted deciduous molar.

While acknowledging insufficiency of proof by our experiments, we unhesitatingly submit the proposition, that, when accompanied by greenish vegetation, the white decay at the free margin of the gums so often noticed on the anterior, and sometimes on the molar teeth of children, and, also, not infrequently on the corresponding teeth of adults, is due to acetous fermentation of the particles of starchy food remaining in the mouth. The characteristic greenish deposit seems to be a necessary concomitant to this process, whether as an absorbent of oxygen, or a fermentative vegetation, or both; or whether its growth is a cause or a consequence of the chemical change, we cannot say. It certainly affords a surface more capable of retaining the elements of eremacausis than the clear enamel, and its general restriction

to the anterior teeth is doubtless owing to their extra exposure to the air. Therefore this class of decay is susceptible, over all others, of prevention, and of control in its incipiency, by eradication of the fungous deposit, and subsequent continued cleanliness. The application of a mild alkali, while doing no harm, would effect but temporary good so long as the local—and perhaps predisposing—cause of the fermentative process remains.

A tendency to a recurrence may be counteracted by suggesting dilute acetic acid—vinegar—as a condiment; the therapy of whose action might be explained by assuming as true the dictum of later physiologists, that acetic acid is the principal solvent in the gastric juice; and if long continued lacking in quantity, such derangement may induce an abnormal effort at elaboration of the desired substance in favorably located parts of the mouth. Hence sufficient supply of the needed substance to the part in need, will, on the apparently homœopathic principle, neutralize the tendency to its unwelcome formation in other parts. However this, by the way, may be, we think we are scientifically safe in the opinion that the kind of decay mentioned is invariably occasioned by nascent acetic acid.

In regard to the effect of the experiment with lactous fermentation on enamel, we find its influence varying, for the time being, according to the resisting density of the individual teeth. Suffice it to say, that on all, there is well marked abrasion, deeper at the necks, and diminishing towards the cutting and grinding surfaces. That lactic acid is susceptible of development in the mouth, we have no doubt; but the peculiar circumstances necessary to its production are so unfavorably situated there, as to rarely supercede the direct disposition of the saccharine disturbance, to pass through the ethyl-alcoholic stage, and on to its corresponding acid.

It is now about four years since the subject of oral electricity has been brought before the profession for discussion, and the earnestness manifested by the few who have investigated the phenomena, commands respectful attention. Prominent in this movement we find the names of Dr. Henry S. Chase, of St. Louis, Drs. J. Foster Flagg and D. D. Smith, of Philadelphia, and Dr. E. W. Foster, of Boston. Recognizing the chemical aphorism that "under the same circumstances, and with the same relations, the same effects always result from the same causes," the affirmative side of the question claims that inasmuch as chemical action is feeble or intense, in a relative degree, according to the electro-chemism of the acting bodies, it necessarily follows that a tooth filled with a substance electrically opposite to "dentos" becomes an active galvanic battery in a fluid capable of acting

upon either. The question may be more briefly and better stated by quoting from a paper by Dr. Chase: "Every tooth containing a plug or stopping is a galvanic battery ready for action, and which is put instantly into action the moment a portion of acidulous fluid touches both plug and dentos. If the plug is water-tight, then the action is limited to the margin of the plug and dentos; if the plug is a leaky one, then, in addition to the points of marginal contact, there is action inside of the plugged cavity at every point where the material of the plug and dentos are in contact."

The theory is further elaborated by the statement that such a battery, once in operation, is not dependant upon acids taken into the mouth for continued action, but devclopes acid by decomposition of the fluids within the cavity; the office of the filling being that of a conductor, a connecting medium, which renders the electric current possible, or in other words, sets up a difference between the dentos and fluids, which without its presence, would not exist; the intensity, or power for harm, lessening in degree of energy as the material approaches the conductivity of the special tooth.

Such, in brief, is the doctrine, founded, apparently, on true scientific principles. Your committee, however, are not unanimous in accepting it "*cum grano salis*," by reason of the fact that thermo-electric excitation may, as well as electrolysis, occasion the observed perturbation of the galvanometer. With this single reservation we will leave the subject for the present, as we do not wish in the least to detract from the honor justly due our colleague, Dr. S. B. Palmer, of Syracuse, for his efforts in developing what he and many others conceive to be a truth of vital importance to the future of conservative dentistry.

REPORT ON CHEMISTRY.

By C. J. ESSIG, of the Committee.

We submit a brief report upon mercury, and its compounds, as used in dentistry, believing it to be of sufficient importance, inasmuch as we find, upon intercourse with the profession, that certain fallacious ideas are entertained by many of its members regarding the chemical and physical properties of this element, and of one of its compounds, known as vermillion, which, we think, should be noticed by this Association, particularly as we are advised that it is becoming by no means uncommon for unprincipled persons, commencing to practice in new places, in order to prejudice communities against their old practitioners and in favor of themselves, to raise a hue and cry against the so-called evil effects of the mercury compound entering as a coloring pigment in red vulcanizable rubber. We find, also, that many physicians believe that the physiological effects of mercury occasionally manifest themselves merely through the presence of an artificial denture formed of red vulcanized rubber; and quite recently a member of this committee was applied to by a patient who had been under the care of an eminent surgeon for a bronchial trouble, which, not yielding to treatment, was attributed to the presence of an artificial denture of red rubber, in which mercuric sulphide, or vermillion, formed the coloring pigment.

Feeling that our profession may experience no little embarrassment by the promulgation of incorrect theories regarding the use of mercury for dental purposes, not only by unscrupulous persons, but by well meaning men

who are not well informed as to its properties, your committee has been induced to investigate the subject, and beg to announce the result of their experiments.

First, we find that one fallacy which is not unfrequently entertained, even by graduates of colleges, is, that the preparation of mercury used in rubber and celluloid as a coloring pigment is an oxide of mercury (mercurous oxide, Hg O); it is needless to say to this body that that compound of mercury is never used for such a purpose, it being an exceedingly active poison, which, with its instability, renders it entirely unfit for use as a coloring pigment.

Another fallacy, and one entertained by both dentists and medical men, is, that mercuric sulphide (vermillion), the compound of mercury which is used as a coloring pigment in vulcanite and celluloid, possesses active properties, and that the red and inflamed condition of the mouth and fauces, so often met with where artificial dentures are worn, is due to its action. This belief on the part of some members of the medical profession is no doubt due to the fact that old writers on materia medica attributed medicinal properties to vermillion, (Hg S) and, although given in enormous doses, it was finally abandoned on account of the uncertainty of its effects; recent investigations have, however, sufficiently demonstrated that it is inert.

Although well aware that both the late Prof. Wildman and Prof. Austin, of Baltimore, were unable to discover the presence of free mercury in rubber, either before or after vulcanizing, we, nevertheless, thought it best, before applying the chemical tests, to make a careful examination of specimens of red rubber, both before and after vulcanizing, that we might ascertain whether during the elevation of temperature to which the material in its preparation, or during the vulcanizing process, is exposed, any decomposition or separation of metallic from the non-metallic element takes place. These examinations were made by the assistance of one of the most complete microscopes in this country, belonging to the Central High School of Philadelphia, for the use of which we are indebted to Prof. Henry Leffman, of that institution. Some of the plates examined had been worn for years, others were new; no metallic mercury was found, but little crystals of sulphur were observed abundantly upon the surface. The specimens were then placed in various fluids, separately acidulated with citric, acetic and hydro-chloric acids, in order to observe the action of each, if any, upon the

rubber; some were also exposed to fluids simulating the saliva and gastric juice; the whole were then subjected to a temperature ranging from 97° to 100° F. for four months, at the end of which time they were again examined by the microscope, and upon the surfaces of those having been exposed to the action of acids nothing was found. The fluids were then tested, first by Reinch's test, without the slightest trace of mercury being discovered. In applying this test to the artificial saliva and gastric juice, the strip of copper, before heating for the purpose of sublimating any mercury that might be present, was found to be coated with a profusion of crystals, which, however, did not decompose upon the application of heat, and were found to be nothing but chloride of sodium. The dihydric sulphide (H_2 S) test was then applied, with a like result; and, lastly, the spectroscope confirmed the previous results, although in some of the fluids, into which had been placed lumps of amalgam, traces of some of the base metals were found, but not mercury.

Our experiments with vermillion (Hg S), or cinnabar, demonstrated the fact that decomposition could not be effected much below a temperature of 600° F., a point which would be utterly destructive to either vulcanite or celluloid. Neither can this compound (Hg S) be decomposed chemically except by exposure to strong nitro-hydro chloric acid; a fact which precludes the possibility of corrosive sublimate (Hg Cl^2) being formed in an artificial denture of red rubber merely by contact with the saliva, as many members of our profession maintain.

Our experiments with metallic mercury, also convince us that ptyalism or the constitutional effects of mercury, is not likely to occur from the presence of amalgam fillings, inasmuch as solution of the element can only be effected by exposure to a strong mineral acid.

DISCUSSIONS.

DR. CORYDON PALMER: Prof. Wildman found free mercury in the vulcanized rubber. I have seen it with a common lens, too, and you can all see it for yourselves. Free mercury does exist in vulcanized rubber. I make this assertion boldly, because I have seen it, unless it was an optical illusion. I did not wish to see this statement pass without contradiction.

DR. GARDINER: I wish to confirm Dr. Palmer's statement with regard to free mercury being found in rubber plates, as I was present when Prof. Wildman showed it to Dr. Palmer. He always impressed us with the idea that it was sulphide of mercury; that paper said it was the oxide.

DR. OSMOND: I have not been able to find free mercury in properly vulcanized rubber. I have filed it up, and exposed the filings to dilute muriatic acid, and I have never been able to find any free mercury. Sometime ago I met with two plates which had been over-vulcanized. The party who made them was one of those individuals who advertised to put up a set of teeth in four hours. I was told by a party conversant with the facts, that the usual time taken to vulcanize any piece of rubber made by him, was only ten minutes, at a very high temperature. I had seen several plates made by this person which had a very high polish, but were brittle. I found a patient who had been salivated after wearing one of these plates, and whose breath had that peculiar odor which results from the effects of mercury. I took one of these plates, filed it up, and put it in dilute muriatic acid and water, and allowed it to remain for three days. I then tested it with iodide of potassium, and I immediately saw the red iodide of mercury. If the rubber is properly vulcanized, I believe no free mercury could be found.

DR. NOEL: From the manner in which Dr. Osmond conducted these experiments I do not think it follows that there was free mercury in the plates he tested. The vulcanization of sulphuret of mercury, of course, did not obliterate the mercury; it was only changed to some other compound, some other salt of mercury. He might take the sulphuret of mercury from any other source, and, by the action of acids and other re-agents, get back mercury in a metallic state; this, I think, he probably did with the rubber. It is within the memory of many present, that six years ago, when the Association met in Nashville, the action of vulcanized plates in inducing inflammation of the mucous surface was discussed; and immediately after the adjournment of that meeting Prof. Summers and myself conducted a number of experiments with a view of coloring rubber with some other substance, hoping to get a color more nearly resembling the mucous membrane of the mouth. In every case where metallic salts were employed, we obtained an ugly black sulphuret. That which most nearly approached to success was the crude carbonate of zinc, under the commercial name of calamine. Blood-root and other vegetable substances were tried.

DR. OSMOND: It is utterly impossible to decompose vermillion by means of hydro-chloric acid; therefore there must have been free mercury, or an oxide of it, in that rubber, as metallic mercury, or its oxide, is capable of being decomposed by hydro-chloric acid. There was no doubt in my mind, though I did not examine with a microscope, that globules of metallic mercury must have been present in those vulcanized plates, in consequence of the high heat employed, which decomposed the vermillion, which is a bi-sulphide of mercury, the affinity of the rubber for sulphur having something to do with it.

DR. JUDD: The question in this case is not whether there is free metallic mercury in these plates or not, but whether or not the red sulphuret of mercury, when placed against the mucous membrane, will produce an irritation. That is the question which is to be solved, and the question that naturally and correctly comes before this Association for discussion. We are well aware that when gentlemen experiment for the purpose of proving some favorite theory of their own, the experimentation, as a general thing, is utterly worthless. If gentlemen wish to experiment for the purpose of arriving at the truth, let them conduct their investigations with their minds unbiased as to what is to be the result, and then there will be some chance of their carrying them honestly and faithfully through, and arriving at correct conclusions. Otherwise they are liable to run into all ridiculous

extremes and absurdities. I have heard of experiments having been entered into within the last year, and reported before a dental society, which went to show that corrosive sublimate was a perfectly inert substance. So now we are made to believe that this red sulphuret of mercury is a perfectly harmless substance. If you wish to make any experiment with this, take a spoonful of it in your mouth and keep it there for an hour, and see whether it will produce any effect on the mucous membrane of the mouth or not. It has been stated that it could not produce any effect because it was insoluble in the juices of the mouth. Arsenic is insoluble in the juices of the mouth in about the same degree, but if any of you desire to experiment with this substance, take a spoonful of arsenic in your mouth and hold it there for an hour or two, and see whether it will produce any effect. I simply want to protest against these insufficient experiments. They do not amount to anything. They lead us into absurdities.

DR. FRIEDRICHS: As far as my observation goes, vulcanized plates do not produce any more irritation than any other plates. Now the question I wish to raise, in view of the fact that there are over a million of plates made of rubber, worn in the United States, is, whether the few cases of disease that are attributed to, and claimed to have been caused by the wearing of rubber plates, do establish the fact of the poisonous effects of the bisulphuret of mercury that is used in the coloring of rubber plates?

Our text books show that the bisulphuret of mercury is entirely inert in its unaltered state; in fact, the metal itself is considered inert, and it only becomes poisonous when in combination with other substances, such as oxygen, chlorine, etc.

I am not an advocate of vulcanite, and make no artificial plates, although it is done at my office, but at the same time, I claim that a report of a few cases of disease supposed to have arisen from wearing rubber plates, is not sufficient to counterbalance the benefit that is derived from the use of vulcanite, nor does it prove to my mind that vulcanized rubber is in any shape or manner a poisonous substance. If it was, we would be in duty bound to ourselves and our patients, to have nothing to do with it.

REPORT OF THE COMMITTEE

ON

DENTAL THERAPEUTICS.

By C. A. BRACKETT, Chairman.

In attempting to present a report upon therapeutics, the chairman of your commitee labors under a number of embarrassments. A combination of circumstances connected with personal affairs has prevented the devotion of as much time as would have been chosen, to study, investigation, accurate observation and record. The same causes have, also, debarred, in a measure, from that frequent association with other practitioners, both privately and in dental meetings, from which much might have been gathered concerning the experiences of others. Again, there is danger of sins of omission from not having at hand complete files of all the periodical literature of the time that has elapsed since the last report. Feeling all this, there was published in the July *Cosmos* a request that anything new in means or methods relating to dental therapeutics be brought to the attention of the committee for incorporation in this report. Quite a number of personal and epistolary inquiries have, also, been addressed to practitioners of acquaintance; but from none of these, nor from the general invitation, has any contributing response been received. With this explanation the meagre gleanings made are respectfully submitted.

In *Johnston's Dental Miscellany* for March, 1877, Page 90, Dr. H. L. Sage, of Bridgeport, Conn., offers testimony to the power of carvacrol in relieving the sensitiveness of teeth much worn down. In a case where nearly all the teeth had come into this condition, the superior incisors having lost half the length of their crowns, their cutting edges and the grinding surfaces of the molars, being excruciatingly sensitive to thermal changes and contact with saline, saccharine and metallic substances, carvacrol in full strength was applied for one or two minutes, with the effect of immediately and completely relieving the sensitiveness. This treatment was made two years before the case was reported, and during that time there had been no return of the sensitiveness. Dr. Sage further testifies that the use of carvacrol in close proximity to the pulp, or even in actual contact with it, does not in the least endanger its vitality, and cites cases in proof. The experience of your committee, while not in every case securing the magical effects described by Dr. Sage, has tended to show that carvacrol possesses valuable and safe obtunding properties, and, that in it, we have an added resource in the treatment of many cases, troublesome both to patient and practitioner. For the alleviation of the pain of preparation of sensitive cavities, carvacrol seems to be fully as effectual as any of the essential oils or their combinations. The odor of the drug appears to be the principal objection raised against it.

During the year several suggestions have been made concerning the relief of sensitiveness of dentine by the attainment of more nearly perfect dryness of the cavity. Dr. Flowers, at the eighth annual meeting of the Pennsylvania State Dental Society, stated that he had for years used with success a small piece of pumice-stone heated and placed in the cavity, sometimes re-heating and re-applying several times. The report of Dr. Flowers' statement is to be found in the December, 1876, *Cosmos*, Page 653.

Prof. T. C. Stellwagen has suggested in the *American Journal of Medical Sciences*, April, 1877, and in a paper before the Odontographic Society of Pennsylvania, April 4th, 1877, published in *Johnston's Dental Miscellany*, April 1877, Page 155, a new cautery, and its application in general surgery, and particularly in sensitive cavities not approaching the pulp. This, though efforts are making by the inventor to improve it, consists of the hot ash and coal on the end of an ignited stick of compact wood. Of its use Prof. Stellwagen says: "It may be well for me to explain that the ash of the wood being ant-acid and warm, I presume effects the neutralization of the fluids, and the dessication of the dentine; while the crushing of the ash and charcoal into the cavity enables the operator to easily reach

the floors of fissures, undercuttings, or irregularities of contour. Finally, the effect may be much improved by gradually increasing the heat until the incandescent coal of fire itself may be momentarily applied, at first to limited surfaces, and eventually crushed into the cavity, thus spreading over all the inequalities of the floor and walls." With this treatment this member of your committee has had no experience.

The galvano-cautery has been tried for the obtunding of sensitive dentine; but, owing to the expense, difficulties and dangers of its application, will probably never be very largely used for this purpose. Several proprietary preparations for sensitive dentine have been brought out; but your committee has not learned that any of them possess sufficient merit to entitle them to notice.

In a report on Dental Therapeutics, and also in Dr. Palmer's report on Dental Chemistry to this body last year (Transactions 1876, Pages 125 and 106), allusions were made to the use of hypophosphite (hy*po*, not hy*per* as erroneously printed,) of lime, as suggested by Dr. E. W. Foster, of Boston, for the prevention of sensitiveness and its frequent serious *sequelæ* following the introduction of metallic filling. I wish now to state that the year's added experience has served only to corroborate the good impressions then recorded. I believe I have used the preparation in no instance without benefit, while in the great majority of cases in which it has been severely tested, there has been no after-sensitiveness whatever. In one of these marked cases, the lady had almost invariably suffered much from thermal changes for weeks, and sometimes for months, after having had gold fillings inserted. She had lost the pulp of the left superior first bicuspid in this way from a mesial filling in a cavity that lacked considerable of exposing it. Her teeth have remained very sensitive to the excavation of cavities; but, in no tooth in which the hypophosphite of lime has been used, has she had any after-sensitiveness. Without going into chemical theories at all, the mode of its use may be simply stated. For convenience of application the saturated aqueous solution is generally employed. The cavity being prepared, and shielded from the ingress of other moisture, is bathed with the solution, which should be allowed to remain undisturbed for some minutes; then that portion of the water which has not evaporated may be aided to do so with the warm air syringe. This leaves a thin incrustation of the lime salt over all the surface which the solution has touched. Dr. Foster claims, also, that chemical union has probably taken place between the hypophosphite and the contained

substance in the dentinal tubuli—a union which looks toward the more complete calcification of the dentine, and the consequent insulation and protection of the pulp. The little layer of lime salt crystals should be allowed to remain in the bottom of the cavity, but be carefully scraped away for a little distance around the borders, as, if left there, direct adaptation of the filling to the walls of the cavity would be prevented, and thus the foundation be laid for destructive leakage. In all cases of merely sensitive dentine, and in a large proportion of cases of sensitiveness from proximity to the pulp, gold may be introduced immediately upon the lime with assurance that all will be well. In case, however, of approximate exposure of quite a portion of pulp surface, it is prudent to supplement the lime with a layer of gutta-percha, or some other insulator. In cases of complete exposure the hypophosphite appears to serve admirably as a pulp capping. The pulp being in a condition for that operation, the cap is conveniently made of a little mass of the levigated crystals, with just water enough to hold them together. This may be gently pressed into place, and surplus moisture absorbed with bibulous paper. Gutta-percha from the chloroform solution may follow it, and all, or the lime alone, may be covered with oxychloride as an unyielding bridge upon which to build the gold. I have thus given Dr. Foster's use of the hypophosphite of lime somewhat in detail, and perhaps exceeding the bounds of strict therapeutics, because I believe that the treatment is not now generally practiced or well known, and because my experience has led to the conviction that it has great merit.

Concerning the treatment of the dental pulp generally, more rational ideas are gaining ground. Our thinking men do not look upon the irritated and aching pulp as an offender to be soothed with all manner of other irritants, escharotics and caustics. It is generally believed, also, that the peripheral pulp cells are the ones to which we must look for the production of the coveted secondary dentine, and, that if they are destroyed over the surface of exposure the chances of permanent conservation of the pulp are very greatly lessened, even if not taken away altogether. Milder remedies, less heroic treatment, non-irritating, or only slightly irritating cappings, are more and more gaining deserved favor.

At the December, 1876, meeting of the Odontological Society of Great Britain, (*Johnston's Dental Miscellany*, February 1877, Page 73,) Dr. Joseph Walker presented by request a paper "On Treatment and Extraction of the Tooth Pulp." A point upon which truth was sought to be brought out, both in the paper and subsequent discussion, was the manner of main-

taining an arsenious application in contact with the pulp during devitalization in such a way as to have it nearly or quite painless. The essayist advanced the idea that very much depended upon having the arsenious acid as finely triturated as possible. His manner of application was to moisten the apex of a wool cone with creasote, dipping this in the finely powdered arsenious acid, taking up the requisite quantity, and then in acetate of morphia. The morphia is thus first presented to the pulp tissues, in the plan that its effect preceding that of the arsenious acid may render the latter painless. Mr. Hutchinson maintained (*Ibid* Page 76,) that painless devitalization was best accomplished with a combination of arsenious acid with carbolic acid alone. On a piece of blotting paper he placed one-twenty-fifth of a grain of dry arsenious acid, and upon it poured one drop of Calvert's No. 1 carbolic acid, deliquesced. In a few moments a small, solid, easily-manipulated mass would be formed. Mr. Hutchinson claimed that this would not only devitalize the pulp painlessly, but that it would stop the pain if the tooth was aching at the time of its application.

In the July, 1877, *Cosmos*, Page 339, Prof. Flagg, in his work "Dental Pathology and Therapeutics," states that during the past year he has been using an arsenical paste in which oil of cloves is made the vehicle. The theory is that an escharotic effect is undesirable in the paste, as the taking up by the pulp of the greatest possible quantity of the destructive agent would thereby be hindered. The oil of cloves is used as being a non-escharotic, while possessing valuable pain-obtunding properties. Dr. Flagg testifies that his limited experience thus far with the paste so made leads him to advise others to try it. His formula is:

R

Ars. Acid,	grs. v.
Morph. Acet.	grs. x.
Ol. caryophylli.	gtt. x.

M

So far as your committee knows, it is not now claimed that any of the various liquids used in making pulp pastes are true solvents of the arsenious acid. That the mixture is mechanical only, is the basis of the first of four propositions which Prof. Flagg lays down in the May, 1877, *Cosmos*, Page 228, concerning arsenical applications to the tooth pulp. The second, third and fourth propositions are to the effect that with properly made applications in fully formed permanent teeth there is no danger of apical penetration and consequent peridental irritation from the arsenous acid itself, no matter how long it may remain. In support of these propositions Prof. Flagg states (June, 1877, *Cosmos*, Pages 285-6,) that his records show that in more than a thousand cases he has left arsenical applications in teeth, for

periods ranging from four days to two weeks; in at least a hundred cases from two months to six months, and in one case, an inferior bicuspid, (August, 1877, *Cosmos* Page 393,) for one year and three days, without any arsenical impression beyond the apical foramen in any case.

While the experience of your committee, so far as it has gone, has been corroborative of these positions of Prof. Flagg, it may not be amiss to remind the inexperienced that in arsenious acid they have an agent of immense power for evil as well as good, and that carelessness in any respect should never be allowed to have anything to do with their use of it.

At the meeting of the Odontological Society of Great Britain, to which reference has previously been made, Dr. Walker (*Johnston's Dental Miscellany*, February, 1877, Page 78,) stated that he found the devitalized pulp very much more readily extracted if the arsenical preparation was replaced after twenty-four hours with tannic acid in combination with creasote or carbolic acid; the coagulating action of the tannic acid rendering the pulp tissues so dense and firm that they might often be withdrawn almost if not quite entire. Prof. Moffatt, of Boston, and others, take advantage of the same property of tannic acid by using it in connection with creasote or deliquesced carbolic acid upon cotton for the permanent filling of pulp canals in some cases.

In the November, 1876, *Cosmos*, Page 582, Dr. J. N. Farrar, of Brooklyn, N. Y., has a short article entitled "Radical Treatment of Alveolar Abscess." The principle of the treatment is the destruction of the abscess sac by filling it with an escharotic liquid like creasote or aromatic sulphuric acid. This, not always otherwise easily accomplished object, he attains by the use of an instrument resembling a hypodermic syringe. The fine point is carried into the pulp canal and the piston is slowly and steadily forced down with a screw till there is evidence that the sac is reached in all its parts with the injection. If one does not choose to use the medicaments suggested by Dr. Farrar, the instrument, with or without the screw attachment upon the piston, seems well adapted to reach the diseased parts with whatever may be desired to be carried to them.

For bad, chronic cases of alveolar abscess, in which a large mass of morbid tissue has been formed, the dental engine, with a coarse, sharp burr.

is an effectual means of breaking up the diseased action. Among those who have followed this plan successfully is Dr. F. Searle, of Springfield, Mass. He prefers, usually, to accomplish the operation with the patient under the influence of nitrous oxide, and uses as a subsequent dressing:

R

Acidi carbolici,	grs. xii.
Camphoræ,	grs. xxv.
Olei Olivæ,	oz. ss.

M.

The first excitement over salicylic acid has subsided; but unlike many of the new medicaments which blaze for a brief time only to sink in darkness, this agent seems to really possess in a good degree the properties claimed for it when it was introduced to notice. In the treatment of foul pulp canals it is of much service; and it makes a neat and effectual prescription for the bad-tasting mouth and fetid breath arising from wounds in the oral cavity that do not heal by first intention. In some localities physicians are using salicylic acid systemically in rheumatic and other affections with much satisfaction.

For the control of undue hemmorrhage the use of hot water has lately been suggested; of its merits I have not learned from tests in practice, nor do I know by whom the suggestion was made.

In the treatment of recession of the gums and absorption of the alveolar processes occasioned by salivary calculus, your committee is glad to see the methods of Dr. Riggs, of Hartford, Conn., becoming better known. Personal experience and cognizance of the results of this treatment thoroughly convinced me of its surpassing merit some years ago, and the tests of the intervening time have only served to show its excellence more clearly. It is to be regretted that few, if any, practitioners are able from natural dexterity or printed instructions, to use the instruments as their inventor intended they should be used. Clinical demonstration, supplemented by pains-taking practice, appears to be the only way in which the necessary manipulations can be acquired.

During the past year, as in nearly or quite every other year since the introduction of anæsthetics became general, there have been deaths under the influence of these agents. To discuss these in this place with anything

like the attention which their importance deserves, would prolong this paper far beyond the prescribed limits. It is closed, therefore, with the simple statement that these deaths are justly exciting among thinking men a disposition to avoid the administration of such powerful agencies for any except the severer operations; while they are engaged in investigating as thoroughly as may be, all the conditions and circumstances under which the fatal results occurred, in order that no discoverable fact having a bearing or an influence in such things, may be unknown or disregarded.

REPORT ON THERAPEUTICS.

By FRANK M. ODELL, of the Committee.

The term therapeutics comes from the Greek δεραπευτικοϑ—curative, or that which pertains to the healing art; from δεραπεα—to nurse, to serve, to cure: From which we deduce that therapeutics is that part of medicine which treats of the way of curing disease; and, in its more extended signification, it treats of the symptoms, the conclusions to be drawn therefrom, the power of nature, and how far *it* may be relied upon for the correction of pathological condition, of the mode of treatment to be adopted, and of the different systems of practice which have acquired reputation. With some the term is also used to indicate the *modus operandi* by which the action of medicine is manifested.

Whilst Prophylaxis would indicate the art of preserving health, Therapeusis would be the art of restoring it when lost; or, to speak more exactly, when dominated by pathological activities. According to this definition, Therapeutics is a science of such boundless extent as to embrace all the collateral branches of the science and art of Medicine. Therefore, whether treating of Iatrology, Histology, Biology, Physiology, Pathology, Botany, Materia-medica, Toxicology, or even of Geology, Mineralogy, Conchology, Ichthyology, Ornithology, or a host of other ologys, alogys, and isms, to show that the former practices of physicians, or their classification of, or manner of employing remedies, that the histogenesis or biolysis of tissue, that the normal or abnormal manifestation of function, that the principles, or mechanical, electrical or catalytic effects, to be derived from inorganic

matter in any of its infinite varieties of presentation, in either the body to be treated, or in that from which the substances or effects to be employed are derived, or are proposed to be derived, whether founded upon fancy or fact, hypothesis or demonstration, empiricism or science, has the slightest bearing upon the history, morbid anatomy, ætiology, diagnosis, prognosis, or treatment of a pathological condition, is to prove the position of the essayist entirely within the bounds of his subject.

As it would be an absolute impossibility on an occasion like the present to fully consider all which the term therapeutics embraces, and being absolutely without advices from the chairman of our committee as to what portion of the subject would constitute his theme, or that of the other member of this committee, I have deemed it best to devote my attention to such general survey of the field, that my paper might serve as a preface to whatever the other gentlemen might choose to write.

To enter upon the proper consideration of my subject without further digression, I would say: A wise and gentle therapia would demand from the medical practitioner thorough investigation and consideration of each case. From a carefully ascertained previous history, (due allowance being made for the veracity of the narrator, in connection with his circumstances and surroundings, and the peculiar malady under which he may be laboring,) deliberate and unbiased inspection, aided by the various appliances of modern diagnostic investigation, from palpation and percussion, to the thermometer, stethoscope and sphygmograph, he will be enabled to form a fairly accurate diagnosis and prognosis of his case. The therapeutical management thereof will then be governed in great measure by the empirical or (to say it more softly,) clinical experience of himself, his teachers and confreres. Here, however, thanks to the modern system of recording cases, together with the light afforded by modern physiological research, in experimentation upon the lower orders of organized beings, as likewise to the flood of illumination which has been shed upon what was purely conjectural and occult by that wonderful little instrument the microscope, he can act with some degree of scientific ability, even in cases which may be new to him; and, he should never lose sight of the fact that *the ætiology of a diseased condition gives the best indications for treatment;* nor of that other fact, which cannot be too often enforced upon the attention of the busy *practicien*, that nature unaided is frequently the best physician; and that the duty of the medical attendant is oftener to simply remove the more prominent obstructions to function (by which I would indicate pain, pyrexia,

œdema, dyspnœa, failure of heart-power, cyanosis, or other urgent symptoms threatening immediate dissolution), and then patiently to watch and wait, in order that the natural forces may operate, than to write prescriptions or to administer medicines. To do nothing is frequently the best therapeutics!

The most manifest indication in the application of therapeutical measures is upon the principle of counteracting starvation. The oft quoted passage, "Man cannot live by bread alone," is ever exemplified in the treatment of pathological condition; impaired function in any organ, or congeries of organs, induces direct starvation of certain of the fluids or tissues necessary to physiological continuity. Hope, faith, serenity of mind, cleanliness, disinfection, quiet, time, rest, sleep, in short, any and every measure promotive of assimilation and normal tissue-metamorphosis, are most potent therapeutical measures.

Promotion of elimination and excretion is the first step towards resumption of the normal processes of assimilation and nutrition. Not only must the cells composing the various glands and tissues, when they have fully completed their developmental condition, be cast off in order that the assimilative processes may be continued by their successors, but their contents must be liberated by disintegration of the cell-walls, in order that each specific product may functionate. Again, the necessity for the secretion of products of these various glands and tissues is not greater than the necessity for excretion of their various components from the general circulatory current. And herein lies the most wonderful exhibition of the economy manifested in the ordinary processes of nature; in that those products of histolytic change, which, remaining in excess within the circulation, would result in speedy dissolution of the organism, excreted by the various emuentories of the body, at the proper time and place, subserve repeatedly the purposes of the system, in the facile removal of egesta, and in the preparation of ingesta for assimilation and consequent nutrition. To this end, water (which is eliminated by so many channels of the body—the skin, the lungs, the kidneys, the bowels,) is usually the first, last, and greatest of therapeutic agencies. True, even water may be the chief factor in pathological states (as in asphyxia, by submersion, or in œdema under its various appellations of anasarca, hydrocephalus, ascites, etc., according to the locality overburdened therewith; states readily induced by imprudent exposure, or acute congestion of kidneys, lungs, etc., whereby, instead of normal elimination, we may have extensive storage of fluids in the areolar tissue), but these are not diseases, in themselves considered, but only unpleasant mani-

festations of deprivation of oxygen, or inadequacy of functional activity when portions of the organism are overtaxed; and, in the majority of œdematous difficulties, the norm would most readily obtain, by administration of additional water, *iced*, while the patient was undergoing that most delightful therapeutic measure, the Turkish bath. As an adjuvant to other remedies, in many instances *aqua ad libitum* makes all the difference between success and failure in therapeutic practice.

Fluidity is *the* condition under which the action of the various vital currents remains a possibility; and the absorption and excretion of water is a principal means for the removal of histolytic products. Many so-called diseases, the direct consequence of an excess of nitrogenous waste, are not diseases *per se*, but simply overaction of certain organs in the endeavor to maintain the integrity of the system—vicarious action. The plain indication in such cases is, First, to reduce the consumption of nitrogenous food; Second, to give large draughts of fluids (in order to assist the natural processes, by dissolving and washing out the accumulated salts); Third, to do nothing to prevent excretion from glands acting vicariously—which is simply nature's mode of cure—excepting by deobstruent efforts which shall restore the excretions to their proper channels, and by restoration of systemic tonicity.

In very many instances, tonics, so-called, do not prove to be tonic in the least when administered pure and simple, but combined with specifics counteracting deleterious material within the circulation, their effect is very soon beneficially apparent. We are rapidly returning to a consideration of the propriety of the ancient empirical practice of purgation and diuresis, as a preparation for treatment; this being one of the easiest and quickest methods of spurring the clogged glands to renewed effort, and unloading the circulation of material which has now become *debris*. But the subsequent therapeutical effort has very greatly changed for the better; and the skin is now one of the first of the emunctories to which remedial measures are addressed.

As this subject opens before me with a limitless and ever vanishing horizon, and as I have, doubtless, already exceeded the prescribed limit of time set apart for each report, I will perorate as follows:

Habits of cleanliness, good ventilation, abundant supply of good food, properly prepared, imbibition of a goodly quantity of fluids, orderly and timely attention to the various demands of the system, which necessarily

implies regulation in both time and quantity of food and exercise taken, as also of the alvine and urinary dejections, and full satisfaction of the systemic demand for sleep, (taken at proper intervals), a persistent cultivation of that love for the neighbor which is a mainspring of a contented mind, together with an intensity of application to some regular pursuit which shall leave no time for ailments, are measures both prophylactic and therapeutic, which cannot fail with most persons, and to which the dentist is not a special exception, of a result which might *a priori* be predicted: the greatest measure of earthly happiness.

DISCUSSIONS.

DR. ATKINSON: It is refreshing to hear such a paper as that, to one who has labored long and worked the power to diagnose and understand the operation of what we call disease and the applying of remedies. I must say that it is the best correlation and statement, of the nature and foundation of disease, and its treatment, that I know of. I never heard a paper that I could not pick to pieces and find fault with before. So much for Odell's paper. I have made a few notes on the paper of Dr. Brackett. I am a little mixed in my recollection, and that was the reason for my wishing each paper to be discussed before others were read. It is almost impossible for the intellect to be so clear as to be capable of catching the points brought out by different papers and afterwards to attribute them to their proper sources and discuss them in their order. Hence, I will pass from the

review of Dr. Brackett's paper, because I would not do my beloved friend any injustice; but I would like to have the points corrected. There was a reference made to sulphate of mercury as being present in red rubber. I wish to give you my best apprehension of reading and observations that I have had upon that subject, and I will sum it up by saying that it is called the red rubber disease, or the bi-sulphide of mercury disease.

DR. TAFT: That was in the paper on chemistry.

DR. ATKINSON: It is therapeutics, anyway, if we cure it. I remember now, it was in the other paper. In the first place, I never have seen a case myself, nor heard one detailed, where this sloughing tendency of the mucous surface, and the sore mouth that is called the rubber disease, or the sulphide of mercury disease, was present, that was not dependent upon a peculiar susceptibility of the constitution of the individual, as learned by the history of the patient's experience, and by the results of the treatment afterwards. The moderate form of the disease I do not attribute to the presence of bi-sulphide of mercury at all. I attribute that to the closing of the mucous follicles, which prevents the normal exudation by shedding of the epithelium, preventing normal formation of mucous secretion, and that may occur under any plate. Whether it occurs oftener under rubber than under other plates, I am not informed. The greatest objection I have to rubber is what seems to be the tendency to induce wasting of the alveolar ridge, and even the palatal portion of the superior maxillary bones, when such plates are long worn. I have never seen a case that did not present this condition to a greater or less extent. I have seen cases that when the subject died and the head was dissected, there was no ridge, and only a noduled mass of calcified material here and there, standing out under a fungoid growth of gum, and the palatal plate perforated, perfectly riddled. That is a terrible condition of things; and if such be the result of the wearing of rubber, either the native or the vulcanized rubber, or from the sulphide of mercury in it, we should know it. I have seen loose, flabby gums that were apparently healthy, entirely deprived of the bony base, so that they were as limp as the soft tissues, and ultimately the patient succumbed to a sort of marasmus that we did not then know the origin of. I never have seen that under metallic plates of any kind. But the second form that I have spoken of, I have seen under metallic plates, and even under what I consider better than all, the continuous gum with platinum base. I merely mentioned these points, and confess my ignorance of the source of the malady: and name these as facts, that certain grave conditions

are seen under rubber that are not seen under any other kind of plates. This subject was under discussion and close observation in Europe, and has been reported in European journals, where a committe of the Odontological Society of Great Britian made investigations regarding it. They reported that, as far as they knew, the bi-sulphide of mercury is *nil* in its action. We heard more nearly what I accept as intelligent views upon that, from Prof. Judd this morning—that there is the action by presence, and by very slight solution. But there was one criticism I want to make upon his remarks, in that regard where he instances the similarity between arsenic and bi-sulphide of mercury. You cannot have action by catalysis from arsenic. A little of it must be solved to take hold of the tissues and convert them. It cannot be escharotic without solution and combination with the albuminous part of the tissues.

Dr. Judd: I have but one word to add upon this subject, and that is in regard to the condition found under rubber plates. I wish to state that I have seen two or three cases in which part of the plate was made of black rubber, and the other part of red rubber; and in these cases, the disease was perfectly and clearly marked under that portion composed of the red rubber, while under the black rubber there was no disease apparent. And I have seen perhaps fifty cases in which the disease was present where the red rubber plates have been worn, and on being succeeded by those of other material, the mouth speedily recovered.

I wish to make one single remark with reference to a subject that struck me while the former paper was being read, and that is in relation to the therapusis of cases where the pulp in a tooth is uncovered. I want to present before this association the steps that are necessary to be taken by nature in order to bring about a full recovery in such cases. Now it has been shown very plainly by my friend, Dr. Black, that in many cases where the pulp of a tooth is uncovered, the attachment of the odontoblastic membrane to the hard tissue is stronger than it is to the soft tissue beneath it, and when the hard tissue is removed, it removes—in many cases at least—this odontoblastic membrane Then, you see, we have a loss of substance in the pulp itself, and in order to have a complete restoration to health, we must have a restoration of this odontoblastic membrane likewise; and especially, if we expect a restoration of the bony tissue, because these odontoblasts are the factors by which this bony covering is formed, or through the influence of which it is formed. Now the question arises, is it possible to restore this odontoblastic membrane? In the first place we

have an authority or two from great men, that bears directly upon this subject; one of these is Billroth and the other Rindfleisch, the two greatest men known to pathology to-day, perhaps, in the universe. It is the opinion of the latter that epithelial cellular structures sometimes arise from the connective tissue cells. On the other hand Billroth distinctly states that it is his opinion that they are never formed from the connective tissue cells, but only from cellular cells of the same kind. In order to understand this perfectly, we must take into consideration the fact, that at the time Rindfleisch wrote this, and incorporated it in his great work, it was not known that epithelial cells transplanted from one location to another and placed upon a raw surface, would spring up and grow. That fact has been brought out since, and, inasmuch as he had sometimes seen upon indolent ulcers little islets springing up at some distance from the margin, he came to the conclusion, very readily, that they sprang from the connective tissue corpuscles beneath, and that was the foundation of Rindfleisch's doctrine in opposition to that of Billroth. It is altogether probable that if he had known that fact he would have accounted for the appearance of these islets in that way, and would have coincided with Billroth upon the main subject, in the view that these cellular elements must spring from cellular elements of the same class as themselves,—that is to say, epithelial cells from epithelial cells. If we take then, as the established doctrine of the present day, this view of the subject, we must conclude that the proliferation must take place from the margin of the wound upon the pulp, and that the proliferation must go forward and restore this odontoblastic membrane before we can hope to have a production of secondary dentine over the exposed portion of the pulp. If we want to bring about this result we must keep this fact clearly in our mind when we cap a pulp or cover a pulp with any hope of complete restoration of the integrity of the tooth in the way that I have described: and if we keep this in our mind we must be careful not to destroy any more tissue than is already destroyed, and give these cells a chance to proliferate and repair the mischief already done Consequently, in capping the pulp I think that it is important that we should cap it in such a way as to produce no severe irritation which might lead to destructive inflammatory action.

Dr. Rehwinkel: In the paper of Dr. Brackett, the question of the methods of application of arsenious acid for the purpose of devitalizing the pulp, was brought up. This is a subject upon which I have experimented somewhat, and concerning which I have come to a definite conclusion. The

general method adopted now in the majority of cases—at least, always recommended,—is to moisten a pellet of cotton with carbolic acid; touch that to the arsenic, and apply the whole to the pulp. To this mode I take exception. I do not want any cotton whatever in the application of arsenic. It is well to understand this matter. After a series of experiments, making these applications in all the varied ways, I have found that the smaller the bulk and the stronger the agent, the better the result will be. I prefer the strongest concentrated preparation of arsenious acid. Squibbs', perhaps, is the best. I take of this as minute a quantity as will answer the purpose—simply mixed with carbolic acid, oil of cloves, or water—it don't make any difference which; because I do not rely upon sending a courier, as morphine, ahead, to intercede, modify, or to produce a local effect, in order that the action of the arsenic may be less painful. It is not the action of the arsenic which produces pain, but it is the pressure of the ball of cotton and the drug, which are placed in immediate contact with the pulp. I usually apply it with a silver, gold or steel wire, which has a small bulbous point. I am always careful to get direct access to the pulp, and to be able to see what I am doing. Then I gently bring the preparation in contact with the pulp, absorb the excess of moisture with a little bibulous paper, and then take a solution of gutta-percha in chloroform and paint this over with a very fine camel's hair pencil in order to exclude moisture and prevent all egress of the arsenic into the rest of the cavity. Finally stop up the cavity—not with cotton, but with a mixture of wax and gutta-percha, or any other kind of gum. Since I have adopted that practice I have yet to see the first case in which I could reasonably trace any bad results to the effects of arsenic.

Dr. Barker: I think we should have very good reasons for abandoning a practice that has been tested by years of experience by ourselves and our predecessors, and when I see men ready to overthrow a practice which has proved successful, upon the opinion of any one person, there should be at least good reasons advanced for the change. We have had a pulp-paste which has been used successfully, and which has been as effective and useful as we could ask for or expect. This is composed, as you are aware, of three ingredients, each one of which I contend plays an important part I am surprised that Dr. Rehwinkel can claim universal success in the application of arsenic. Let us examine the cases which present themselves almost daily in practice. They come to us in a state of inflammation; we have congestion of the capillary vessels. What is the result? I do not care whether it be the arsenic alone, or combined with carbolic acid, or

arsenic with morphia, or creasote, or anything else which is applied under such circumstances, there will, in a majority of cases, be pain; which is due to obstruction and retardation of endosmotic action from the plethora of the blood vessels.

DR. REHWINKEL: For the sake of being concise I did not touch upon the conditions of the pulp; I simply wanted to endorse the statement in the paper with reference to the mode of application. I did not want any one to understand that I think the condition of every exposed pulp is alike. That is taken into consideration when the application is made.

DR. BARKER: I have only to state that for pulps that are not in a state of inflammation it is not necessary to apply anything but arsenic. I supposed that the gentleman took those cases which present themselves usually in our offices, which are found in that condition.

In reply to Dr. Judd, who asserted, as I understood him, that we should never, in attempting to cap pulps, make use of any escharotic for fear we should destroy the odontoblasts and possibly prevent their re-formation, I would say there is a disputed point here; the best pathologists and physiologists of to-day tell us that we have to depend upon the activity of the cellular elements for reproduction of tissue, and that it is necessary that a certain amount of irritation should be excited to induce this elaboration. We can encourage the effusion of plasma and its organization, by simply touching the exposed part with carbolic acid, because it acts as a protective and relieves the congested condition of the vessels. It destroys a portion of tissue, because its chemical action is so great, and forms a pellicle upon the surface. This is carried out exactly in the same way in other tissues. An ulcer upon the hand that refuses to cicatrize, may be encouraged to do so by the application of nitrate of silver or some other such agent which will destroy the surface and act as a protective, the same as in the case of the exposed pulp.

DR. ATKINSON: With regard to our knowledge as to whence the lime salts come which furnishes this protective covering over exposed portions, we must understand general and special circulation, to determine. I have seen amalgam fillings of two, three and more years standing, removed, which had been placed directly upon exposed pulps, and found the pulps healthy, with no intervening deposit between the amalgam and the pulp.

I have seen that repeatedly. I have seen other conditions that seem to favor the concept that these bodies called odontoblasts that surround the wall or the margin of the opening of the hard substance of the dentine into the pulp cavity, were the calcifying agents that crept over and utilized the lime salts, and closed in gradually, and at last did seal in the pulp beautifully, and protect it by perfect restoration of the dentinal wall. This has been often seen.

Now as to calcification being necessarily the product of the odontoblasts, I guess we had better enter a caveat there. Dr. Judd has beautifully given us the growth of these concepts from those two noble men that I admire very much, but we must go a little step deeper than they did into embryology before we can comprehend the whole process, and the forms of calcification. The Doctor almost said so; he said epithelial bodies of the same kind. God bless him for being able to determine that there are epithelial bodies of different kinds in the very first and simplest form of alimentary tract and glandular body. There is not an embryonal corpuscle that comes from a membrane, that is not formed from unpronounced protoplasm that you cannot see any differentiation in, any more than in water, without the use of a reagent, and these are sometimes calcified at this point, and show what are called interglobular spaces in the imperfectly developed teeth.

It is possible for calcification to take place place without having a complete formation of an odontoblast, but when they can form in sufficient quantity, and have sufficient lime salts in them, they calcify regularly; otherwise embryonal corpuscles will be formed into calcoglobine; that gives evidence of their globular form only in a state of rest; on the surface they may calcify at that stage, and then you will find no dentinal fibrils, no canals or appearance of canals, but a complete lime rock intervening between the pulp and the filling, of whatever it may consist.

REPORT OF THE COMMITTEE

ON

OPERATIVE DENTISTRY.

By GEO. H. CUSHING, Chairman.

Your committee do not propose, at this time, to go over the ground which has been so fully covered by recent reports on this department, but to endeavor to lay before you in a concise manner the present status of operative dentistry. The outlook is a somewhat peculiar one—certainly claims serious attention, and cannot fail to afford much food for thought.

It is hardly necessary to state that for several years last past there has been a very strong feeling among the better men of the profession, that the results of many operations on the teeth, particularly those performed upon the proximal sides of bicuspids and molars, were not proving as successful as had been hoped, or, perhaps, as had been the case during former years. This naturally led to inquiry into the causes of this condition of things, and various theories were advanced intended to satisfactorily explain (to the minds of the authors thereof,) this generally recognized phenomenon. Some claimed that this was simply the result of faulty operations. Were this the case, a remedy could hardly be hoped for, as these conditions are observed among men whose skill is far above the average of our best men, taken as a class; for though such criticism implies the possibility of such perfection of

operating as to render such failures impossible, yet the facts go to show that such skill rests with so very few men that practically it is unavailable for the benefit of the patients of most of the profession. Others, again, claimed that such failures were due to the use of cohesive gold, and suggested, of course, as the remedy, a return to non-cohesive or (so-called) soft gold. That this is not a satisfactory explanation, would appear from the fact that many of those observing these unfortunate results in their practice during the few years last past, had not experienced any such misfortunes in the years preceding, though using cohesive gold exclusively during both periods. Again, it was claimed that the gold was over-malleted, especially at the cervical margins. This undoubtedly explains a part of the failures, yet it can hardly cover all. Last of all comes the "Electro-Chemical" theory as a full explanation of the whole matter. Thus far the advocates of this theory have failed to furnish any proofs of its truth. Experiments out of the mouth do not establish anything as occurring within that cavity, and yet so important did it seem, to arrive at some solution to the question "why such failures were so common," and so unsatisfactory had been all previous explanations, that the profession hoped that the truth had been reached at last, and some were inclined to act upon the suggestions springing from the discussions upon this theory; but more mature thought probably convinced the majority, that there was not any satisfactory ground as yet established upon which to base a new departure in this direction.

In connection with this subject we have observed that a great deal has been said during this period in favor of tin as a better material than gold for preserving the teeth. Among the older practitioners particularly, this is true, and many seem to think there is some chemical influence exerted which tends to preserve teeth filled with tin. However that may be, the fact is quite apparent that very many have the strongest conviction of the superiority of tin over any other metal or substance of any kind, and some, in consequence of that belief, have used it in certain cases for filling over cervical margins, completing the operation with gold. Your committee are not aware of any conservative effect of any filling for carious teeth other than that secured by perfect exclusion of air and moisture from the cavity of decay, and if it is true that tin serves as a better protection than anything else, it is probably due to the fact that it can more easily be manipulated to produce air- and moisture-tight margins than any other material, though it may be impossible for us to demonstrate the fact.

Your committee have endeavored to obtain as reliable information as possible in relation to the present position of the profession on the points

suggested by the foregoing remarks. This information has come from a somewhat extended correspondence with representative men in various sections of the country, and also from quite an extended personal exchange of views, and, as a result of such information, the following conclusions are reached:

1st. That the use of tin in combination with gold, as suggested by the discussions of the theory of "electro-chemical action," advocated by Dr. S. B. Palmer, has been resorted to to a very limited extent. It, the tin, would seem to have been used by a few operators, chiefly as a covering and protection for the cervical walls of proximal cavities, the balance of the filling being completed with gold. Some of these have evidently used it because of their old time belief in its value over other materials for filling, without attempting to explain the reason of its superiority; others, again, have used it—experimentally—simply because it had been suggested; while some few, doubtless having faith in Palmer's theory, believe they see a scientific reason for its use in this manner.

2d. The use of amalgam has largely increased during the two or three years last past, and more particularly among men of high repute. From fifty-five communications upon this subject, thirty-six express the opinion that there has been an increase in its use by the better class of operators; some say a large increase, others a perceptible one. But five say there is no increase, while but one says it is on the decrease. The balance of the fifty-five either express no opinion or else a very vague one. This increased use of amalgam may be ascribed to various causes. The experiments of Bogue, Hitchcock, Cutler, and others, invited a more serious attention to the subject of amalgams than had before been given to it; and, co-incidently with these experiments and the discussions arising therefrom, a great improvement in the character of the alloys offered for sale, led those who had formerly used but little, to enlarge their use of it very considerably, and many men to make use of amalgam who had never before tried it. Many of these commenced its use experimentally, without any reasoning upon the subject, except that gold failed to accomplish what was sought, and they were ready to try amalgam because others attested to its superiority; others, again, commenced its use, or used more than formerly, because convinced by the reasoning of Dr. Palmer and others that it was more compatible with tooth structure than gold. Others, again, were actuated by some of the above reasons, and an added one of the necessity of using something which should be less expensive than gold, owing to the pressure of the hard times. These reasons

doubtless were the actuating influence with honest practitioners, and have no reference to that class who seize upon the example and teaching of prominent men as warrant for a more enlarged use of a material that they had never used either properly, intelligently or honestly; with that class this report has nothing to do.

3d. The use of non-cohesive gold has largely increased during the period under consideration, and seems to be still increasing; this especially for application to the margins of cavities, and most particularly to the cervical walls. Its use would seem to be, as a rule, in connection with cohesive or semi-cohesive gold, which is used for completing operations. As the use of non-cohesive gold increases, so does a return to hand pressure in part supplant the use of the mallet. Reference was made in the report on this subject, read before this Association at Detroit, to the tendency observed then to return to old methods. The evidence upon which this report is based goes to show that such tendency is on the increase. Also in the matter of cutting away the teeth with reference to securing permanent separations, the weight of testimony shows an increased tendency in that direction; not to the carrying out of Dr. Arthur's system, but to the establishment of a conservative system of part cutting away, and partial restoration of contour. While we find some who still adhere rigidly to the idea of restoring contour in all cases, and others, again, who insist upon the widest separation, yet the rule would seem to be the following of a conservative and eclectic plan, endeavoring to judiciously adapt the treatment to the requirements of the case.

Thus it would seem from the testimony, to be clearly the fact that operative dentistry to-day occupies more than ever before a conservative position; that is, not running to either extreme in methods as a rule, and making its practice generally eclectic. This, in one sense, clearly is an advance, and would seem to augur well for the future of the profession, but unless this eclecticism is based on sound philosophy it must be in part a delusion; and it would certainly seem to be a pertinent inquiry, upon what is this observed modification (change,) of practice based. Is this return to the use of non-cohesive gold the result of any positive evidence in its favor, or of the negative evidence against the cohesive gold, or is it in part or mainly to be attributed to the desire to render operations more speedy and easy of accomplishment? The solution of this question would seem to be a difficult one, because of the many and diverse elements necessarily entering into its consideration. If we are told that the fillings

of non-cohesive gold inserted thirty, forty, and even fifty years ago, are doing good service to-day, and that they furnish ample evidence in favor of that material, we are met on the other hand by the statement that the teeth of earlier generations were of a better character than those which we operate upon to-day, and that we of to-day undertake to preserve a class of teeth that by our predecessors were invariably consigned to the forceps; so that it cannot be said that we have any proof that is convincing. The same remarks are equally applicable to amalgam, and perhaps to tin. Again, in taking such cases of long-standing, old-fashioned fillings, as evidence on one side, we entirely ignore the lost evidence on the other side, which departed with very many of that same class of fillings: How many such proved failures, who can tell? And who can say that very many of the fillings of cohesive gold inserted to-day, will not be standing equally well with the above referred to, thirty, forty, or fifty years hence? The data upon which to base a scientific conclusion seem here altogether inadequate. The convictions of individuals not based upon demonstrable facts, or long tried experience, may be sufficient authority for the individual, but they can form no sound basis for any scientific mode of practice to be formulated for the profession generally. Of course it must be apparent to all that in the nature of the case a successful mode of practice in operative dentistry can only be formulated from a comparison of results of experiences of long duration, of different methods pursued by honest observers who shall have kept careful records of the results of all their operations. Have we any such basis now to work upon? Are we not, then, standing upon somewhat uncertain ground? Can we give a reason for the faith that is in us? We have in our ranks a few extremists who contend that nothing should be used for filling teeth but gold, and that of a certain kind, and after a certain method; and, on the other hand, a few may be found who urge the abolition of gold, and a resort to amalgam for filling all cavities—some very prominent gentlemen and teachers going so far as to say that the "coming dentist is to be a plastic man." Is it possible that these can advance any scientific basis for their claims? Should not, then, the thoughtful consideration of the present position of operative dentistry inspire us to a greater earnestness, and to the pursuit of more thorough and well considered methods of investigation, in order that the reproach may be removed which has been cast upon us. "that knowledge has to wait upon assumption and dogmatic opinion?"

In concluding this report your committee would venture to suggest their convictions as to that which is needed in view of what has been here said, and they cannot do so in any better manner than by quoting. as

expressing their sentiments in concise and forcible manner, the language of one of their communications upon this subject: "What we most need in 'Operative Dentistry' is a well-digested method of teaching, under the administration of honest, capable, enthusiastic teachers, who shall not be dependent upon the pupils whom they instruct, for their salaries, nor have to earn their living by general practice in their own offices. * * * One or two really good institutions endowed so as to be independent of pupil patronage" is the great need of the present time.

SUPPLEMENTAL REPORT

ON

OPERATIVE DENTISTRY.

By A. W. HARLAN, of the Committee.

The chairman of your committee on operative dentistry has already presented to you the record of another year's progress in this department of our specialty, and the duty of preparing a supplemental report has devolved upon me, in which I am expected to lay before you something that shall at least provoke discussion, if it does not instruct.

This is a subject so practical in itself, and one which engages so much of the dentist's time from day to day, that everything new in relation to it is eagerly listened to, or read, as soon as published, making it a matter of some difficulty, if not wholly impossible, to present to a body like this anything with which it is unacquainted. It will, however, need to be discussed and re-discussed until the means of preventing decay of the teeth are far more reliable in practice than any system now in vogue. This being a true statement of the case, I feel no apology necessary for presenting this paper.

It seems to me that the least observant among us cannot have been blind to the fact that the dental profession at the present time is questioning itself very closely about one thing, and that is, whether it is doing all that could be expected of it in the effort to save teeth. This fact possesses greater significance for us now than at any other time in the history of the profession, and it promises to engage the thought and tax to the fullest extent the resources of our best intellects in its successful solution. We are unable to account for the wide-spread agitation of this subject now, in any other manner than by reference not so much to the growth in numbers, as to the diffusion of knowledge, and the tendency to individual thought and experiment among the members of the profession generally, by the aid of dental journals and societies, and the work which every conscientious teacher, in and out of college, has been doing, not only in his efforts to instruct thoroughly, but at the same time impressing on the mind of the student the necessity for continued and unremitting effort as the only sure means of earning high rank in his chosen profession. This was not the condition of things fifty years ago. Then, if a new discovery were made, such was the short-sightedness of the mass of the profession that it was kept selfishly hidden in the bosom of him who made it. The practitioners of those days, it is true, had not the facilities for communication and intercourse with each other that we now enjoy, nor did they seem to feel the need of it, except in rare instances; but the time soon came when a few cultured and progressive men joined their ranks, and, by their high character and attainments, and the free interchange of individual experience, infused a spirit of study and investigation in the minds of those more selfish, until they were themselves induced to contribute to the general stock of knowledge. This was the commencement of that general spirit of inquiry which from thence until the present time has been one of the proudest boasts of the dental profession. During this period has grown up our present system of education, the formation of societies, and the establishment of dental journals, through which even the humblest in our ranks can contribute his mite to the sum total of our professional knowledge. We have enjoyed these privileges so long now that no thinking practitioner is content to accept the mere statement that a new method of operating, or style of practice, or a new material, is better than an old one, because it happens to be endorsed by Dr. A. or Prof. B., but he must have such good and sufficient evidence of its value as shall convince him that he will not be humiliated by failures in case he should adopt in his own practice their recommendations. If it be not forthcoming, he ought to be able to demonstrate for himself the truth or falsity of their assumptions.

The attentive reader of our periodical literature at home and abroad for the past three or four years, has only to take a retrospective view of the matter contained therein to be amazed at the amount of space devoted to amalgam, and it seems as though it were only the commencement of the inquiry into its peculiar merits as a substance for filling teeth, as it is now almost an impossibility to pick up a dental journal without finding one or more articles in which it receives commendation or disparagement. Now that so much has been said and written on the subject, I thought it was high time that this, the representative body of the dental profession of the United States, should engage itself in setting at rest some of the fallacious and grossly incorrect ideas that a few of their number seem to have absorbed in their advocacy of it. Not having the fear in my mind (as at least one member of this Association had at a former meeting,) that "if we ever undertake to discuss amalgam it will be a curse to the operative department, as rubber has been to the mechanical," I herewith present the following: The investigations of Professors Hitchcock, Bogue, Cutler, and others, we need not gives a synopsis of at this time, as they are so well-known as not to need it. The experiments of Dr. Bogue seem to have settled one thing pretty definitely, which is, that no constitutional ill effects are to be apprehended from the use of amalgam in filling teeth; but from his concluding paragraph I dissent. He says: "It will be seen that if almost any amalgam is used intelligently, teeth can be filled so as not only to preserve them, but to do so without danger to the general health from any element in the fillings, unless it be of copper;" of that he is not sure. My reasons for dissenting from his conclusions are drawn from experience, from observation, and from a positive conviction that there is such a want of uniformity in the alloys which are in the market, that it is useless to expect the same results to follow their use in every case. I believe that it is not saying too much to say that there is not now manufactured an amalgam which in practical use does not contract in hardening, notwithstanding the fact that some of them appear to stand the tube test for leakage, at an uncertain temperature, for two or three months consecutively. My reason for saying this is, that, without exception, the interior of a cavity which has contained an amalgam filling presents a blackened surface, and this comes from oxidation, a thing utterly impossible when an air- and moisture-proof filling has been inserted. Conceding this to be a fact, does any one claim that such a filling will preserve a tooth as well as one which has no other virtue than that of hermetically sealing the cavity? Is it reasonable to expect that a tooth will be preserved from further decay after the inception of a malady, however slight, that changes to an abnormal condition the

fluids of the mouth, if in it there be a leaky filling? I do not believe that teeth are, or have been, saved by the use of amalgams, except when used in those very hard and dense classes of teeth; and in those cases we find that the cavities are of the simplest kind; such, at least, is the result of my observations. Would it be natural to expect that a leaky filling would act as a recent writer has said on this subject, in comparing a leaky gold filling with one of amalgam? He remarks: "Leakage is one of the worst defects in a filling, and it is many times worse in connection with a gold plug than with either amalgam or tin. In the case of a leaky plug, galvanic action takes place between the plug and the dentos at every point at which they touch each other. In the case of a gold plug, the dentos is disintegrated, and by its disintegration the acid condition is kept up, stimulating to greater activity the galvanic action. In the case of amalgam and tin, the oxide of the metals penetrate the dentos and render it less positive than before, giving it harmonial relations with the tin and amalgam by being made something like them, by imbibition of the oxides; when this has taken place, electrical action ceases, because the dentos and the metals of the plug are on the same potential plane."

Is not the above an unanswerable argument in favor of amalgam? Do you not see why, under certain circumstances, the worst possible material with which to fill teeth, is gold? Further comment is unnecessary. One of the most enthusiastic writers in favor of amalgam for a permanent filling material, says: "If any of the most bitter opponents of amalgam, will produce two authenticated cases, or even one, where a good amalgam worked in a proper manner, has failed in any one point to do everything which was expected of it by its most 'ardent partisans,' I will never say another word in its favor." But his wisdom is greater than that of the whole profession combined, for he concludes by saying, "I know too well from experience, that such a case cannot be found." I submit the above to you, and ask if it is not disheartening to those of us who still have sufficient faith left in the preservative qualities of gold, tin, and some other ephemeral stoppings, to continue using them in the face of such an assertion. Here is another statement which has *not* been shown to be true; the writer says. "Gold has been shown, by actual experiments, to be the most electro-negative substance which is used in teeth. * * * * And it has been shown that tooth substance (dentos,) is more electro-positive than any of the filling materials which we use." Further: "It must be instantly admitted that a plugged tooth is in a dangerous condition, aside from the fact that a portion of the tooth substance has been lost and the

pulp possibly interfered with" These extracts are presented as veritable curiosities in a dry and matter-of-fact literature such as ours. I do not instantly admit that a plugged tooth is in a dangerous condition because it happens to be filled with gold. The experiences of the past two or three generations of dentists must indeed have presented a sorry record for those of the present who still continue in the face of such a long list of failures as the above would indicate, to consign a tooth to certain destruction by filling it with gold; nor do I believe that it is admitted by any one who says to himself that his object in filling a tooth is, first, to prevent the recurrence of decay, and second, to fill the tooth so thoroughly as to exclude air and moisture. Can anything else be accomplished by the operation of filling a tooth? What miraculous influence is it that is so potent in saving a tooth by the use of amalgams, when they do not shrink after their insertion? Is the exclusion of air and water from a cavity anything more than a mechanical operation? If it is nothing more than this, how is it possible for dental alloys to exert a chemically preservative influence on dentine if they do not leak around the margins after insertion? Must we conclude that there is such an affinity for amalgam by the mixed fluids of the mouth that it alone suffers loss of substance when there is an ailment sufficient to furnish an acid saliva? Does experience show that there is any loss of an amalgam filling when in practical use, except by attrition? I think not. I do not comprehend such far-fetched reasoning when it is based on experiments conducted wholly out of the mouth.

The writer of the above extracts has a process of his own by which he has been enabled to determine the approximate amount of loss which *living dentine* sustains when compared with the different filling materials in use. I was the first person to question the correctness of his conclusions, in a note despatched to him soon after listening to his paper on "Oral Electricity," in May, 1876. The answer received contained a promise of an explanation soon. Since that time has been published another article on the same subject, addressed "To students and young practitioners." But the promised method of determining that vital point was not given. I am in ignorance of it to this day; however I make the following extracts from that article. He says: "Let us make an electro-positive scale of the materials with which we plug teeth, including dentos itself. The most positive substance will be mentioned *first*, and then they shall follow according to the strength of their position. Dentos (dentine or enamel), Smith's Ox. Chlo. Zinc, Hill's Gutta-Percha, Tin, Amalgam, Gold. Either of these substances if united to one anywhere below it on the above scale, will dissolve more rapidly in an acidulous fluid

than if alone in the fluid. A current of electricity is evolved, passing from the more positive to the less positive substance, and at the expense of the more positive. Between *dentos* and *ox. chlo. zinc* the current would be weaker than between *dentos* and *tin*. Between *dentos* and *gold* there would be a stronger current than between any other two substances; consequently the dentos would be broken down or dissolved more rapidly than it would be if united to tin, amalgam, or the other materials in the list. * * * * Dentos is a poorer conductor than gold or tin, yet whenever either of these metals are united to tooth substance, then the latter is readily destroyed if there is an acidulous fluid in which both are immersed." "*Living* dentine," says he, "has much greater conductivity than dead dentine." Until the author of the above can substantiate, in some manner, the correctness of his conclusion, (which is not very apparent,) that living dentine does stand in the relation to the different filling materials in which he has placed it, I cannot accept, for myself, its finality. It is true that we may not be able to prove the contrary, but one thing we are sure of, and that is, of the known impossibility of immersing a piece of dead dentine or dentos in an acid liquid and determining from the amount of loss by dissolution of its substance the percentage which it would have lost had it been possessed of vitality. Our author's further conclusions are, that the nearer a plug is to dentos on such a scale as presented, the better is that material for saving purposes so far as galvanic action is concerned. To use his own words, "this would make ox. chlo. zinc the best filling in some respects. * * * Hill's stopping comes next on the scale. * * * Tin follows the last. * * * It is more easily made water-tight than gold. * * * Amalgam comes next. It is easily made water-tight" (in a glass tube?) "if the alloy is properly prepared, more easily than with gold or tin, and it bears mastication as well as gold. Gold" he says, "if properly manipulated can be made water-tight, and wears well; it produces stronger galvanic action united with the tooth than any other filling material." Are we prepared to accept these conclusions, so antagonistic to all of our previous experiences, based as they are on the supposition that the one vital material, dentine, stands in the relation to filling substances in which it is placed? What a mighty revolution in prospect for those of us who have striven to educate our hands to do the bidding of the brain in creating those finished and certain destroyers of the teeth into which they have been wrought!!!

One eminent gentleman, an enthusiast on the subject of plastic fillings, says, "I know that some few men have the peculiar art of manipulating

gold more successfully than the vast majority, just as some few artists have extraordinary and unattainable skill with paint, with the chisel, and with musical instruments;" while another equally eminent, to my mind, though he does hit hard, says, that the operation of filling a tooth with gold is one of the simplest and easiest, and he would almost agree to take from the street a youth without knowledge of such an operation, and teach him to fill the simpler cavities very acceptably in six months. I cannot agree with either of the gentlemen quoted; the first requiring rather more skill than is absolutely necessary in successful practice, and the second not requiring quite enough. At last we seem to have found the vulnerable point: it takes too much time, and requires more skill to fill a tooth with gold than it does with amalgam. There's the rub. And then, after the tooth is filled with gold it fails to exert that chemically preservative influence which is so necessary to the dentos; and that is another reason why amalgam is better in their hands than is gold. In the hands of those who feel incapable of inserting a moisture-proof filling of gold, any of the baser metals or stoppings are infinitely to be preferred to extraction of a tooth; but from the experience of the many, from that of the most successful operators, amalgams have proven themselves in actual use, without regard to tube tests, so unreliable that we are unable to point out one single practitioner in this broad land of ours who has made for himself name and fortune, or either, or one who has succeeded in preserving an equal number of teeth by its use, side by side with one who has tried conscientiously to do likewise with other substances. I am not disposed to underrate the value of the recent investigations on the subject of amalgam, but I do protest against any one claiming for it superior virtues which the whole profession have been unable to discover in its more or less constant use for a half century, no matter from what quarter or from whom it proceeds. So far, what good has been accomplished by its re-discussion? One who looks the question squarely in the face finds that where there used to be one kind of amalgam there are now half a dozen, all claiming to be what a large majority of them are not, i. e., perfectly harmless, and the very best of filling materials for "badly decayed molars;" each one yielding a different result when analyzed, and no two results of any one of them on second analyzation showing anything like uniformity, or approximating the first. To these defects it may be added that the directions for use equal in number the varieties manufactured; and add to this an increased sale, not only in one section of the country, but all over it.

When we have Dental Journals saying month after month that gold under certain conditions is the worst possible material with which to fill

teeth, and proclaiming this as the truth beyond question, is it not time to stop and ask if this be progress? Would it be unnatural to suppose that some of the younger men, and possibly older ones too, might conclude that perhaps amalgam was a cure-all, and go to using it vigorously, and probably at the same time be doing an injustice to their patients? We only dare hint at such a probability. The dental profession owes to itself, and the public whom it endeavors to serve, to see to it that this question of filling teeth, and with what substance (if any,) it is most surely to be accomplished, shall be discussed at this time in a manner which its importance deserves. We can no longer claim to be a liberal and progressive profession if we do not take upon ourselves the duty of solving this question. We know that the use of gold, i. e., the intelligent use of it, is sure to produce certain results; the same may be said of tin, but of amalgam it is the height of folly to expect to obtain an uniform result in the use of it by the wisest among us. It seems as though some such plastic compound were a necessity in certain communities, and for good reasons that are apparent to all of us, and the only way that suggests itself to me in which we are to derive any permanent benefit from its consideration, would be the appointment of a committee to investigate and experiment until they arrive at a definite result, and report the formula of an alloy that will, with reasonable skill, care and judgment, give a non-shrinkable and reliable substance for filling teeth, and one that shall not be in any way injurious to the general health. Then, and not till then, will the great public, through and from whom we receive recompense, be benefitted by our labors in their behalf.

DISCUSSIONS.

DR. RAWLS: I believe that our failures occur not only on account of imperfect materials used, nor on account of a want of skill, but because of the existence of animal fluids in the dentine, which are constantly coming into contact with the filling, causing oxidation when the material used is of a nature to be oxidized, and in other instances bringing about disintegration of the dentine beneath the filling; the latter is especially noticeable in the teeth of young persons where the dentinal tubuli are large. If you desire to test this matter, adjust the rubber dam on a tooth, cleanse and dry well the cavity until it presents a white, powdery appearance, after which cover the cavity over with a bit of rubber, or other material, to prevent moisture in the atmosphere from condensing on the dentinal surface; leave it there for a few seconds, and upon looking into the cavity you will find that the dry, white appearance has disappeared, and in its stead you will observe the darker appearance charateristic of dentine when filled with its natural fluids. In cases where the dentinal canals are large, admitting of an abundant flow of the animal fluids, plastic fillings can often be used with more success than other kinds.

DR. HOWE: During this discussion I have seen very much light thrown upon these subjects by the relation of facts, and I have seen them very much darkened by theory merely. More than a year ago a gentleman came into my office suffering from a tooth which six years previously I had filled with amalgam. He had been traveling west, and found himself with a very sore tongue, and he consulted a physician, who prescribed for him, treated him for a week or more, and, affording no relief, he said, "I will make a thorough examination of this case;" then took the speculum, made what he called an examination, and, so soon as his eye glanced upon this tooth, he laid down his speculum and said that it was a very clear case of

mercurial sore tongue: the only possible relief for that would be the extraction of the tooth. The tooth having done good service for a number of years, the gentleman thought that he would not have it extracted, but wait until he got home and consult me. I looked at the tooth and the tongue, and, with a corundum wheel I smoothed the edge of tooth, which had become by grinding wear as sharp as a knife on the lingual edge, and had continuously cut the tongue. I said, if you have any more "mercurial sore tongue," come again. He has not been in since. I saw him upon the street, and his tongue was well.

Dr. M. H. Webb read the following paper:

While I coincide with Dr. A. W. Harlan in nearly all he has stated in reference to amalgam, yet I desire to refer particularly to the report upon "Operative Dentistry" which he read at the meeting of this Association last year. In an otherwise good report he asserted that "the perfect contouring of teeth is the most absurd of all hobbies." No better evidence could be desired to indicate that he who makes such an assertion does not fully understand the principle of, and is unable to properly perform, those operations known as restoration of the contour line of an organ which has been wholly or partially broken down, or fractured, by caries. Since "the *perfect* contouring of teeth is the most absurd of all hobbies," it may be inferred that "*imperfect*" contouring is what Dr. Harlan terms "wise conservatism." Really perfect restoration of contour "demands" far greater "perfection of good judgment" than that which was referred to as "wise conservatism." Whatever is worth doing at all is worth doing as perfectly as possible; and it is entirely wrong to accuse those of having "hobbies" who always endeavor to do this. No one should ever enter upon a calling, or pursue a work, unless he be enthusiastic in, unless he love, that work, for "*By their works ye shall know them.*"

In reference to this matter and to various assertions, I would further say that no one's theories should be accepted, nor teachings followed, unless he who announces them has *demonstrated*, beyond a question of doubt, that he is really capable of properly doing that which he professes to do. It is also important to know whether all those who propound, advocate, or accept the "theory" of recurrence of caries around or about fillings, because of chemical action and evolution of electric currents, are truly first-class operators. If, for instance, Thos. Fletcher, of England, was really capable of performing even creditable operations, then his opinions upon such matters

would be entitled to some consideration; but because he is not thus capable, his tests in reference to the "leakage" around gold fillings are worthless. Even if he was fully capable of performing an operation well, he, nor no one else, can insert gold in a glass tube without having a movement of a portion or the whole of the mass of such gold, because there is no good foundation to build upon, no starting point. A something might be put in one end of a tube, and be so arranged that a foundation may be made, but unless this is done, no form of gold can be anything like perfectly packed in such a place, whether the gold be cohesive or non-cohesive. Even the insertion and packing of pellets and cylinders in cavities of decay, without some movement which would lead to that which is called "leakage." is quite as uncertain.

Dr. S. B. Palmer, the most reliable investigator in the department of chemistry which relates to the action of acids upon dental tissue and the evolution of currents between metals and calcium, stated at the last meeting of this Association that he agreed with your speaker that "failures, in a a great measure, are due to imperfect operations, * * * * to imperfect contact of the gold against the dentine;" and, that "where there is no moisture, there is no action." He stated, however, that "if a gold filling fails in the hands of a practitioner of average respectability, in certain cavities and certain teeth, it reduces that tooth to the second class of teeth, viz.: those which must be saved by some other agency than gold." I desire to say that a practitioner may not only be of "*average*," but of the *highest* "respectability," and yet not be a first-class operator. A tooth is not necesarily "*reduced* to the second class of teeth" because of the failure of a gold filling, even if he who performed the operation was really a first-class operator.

While Dr. Palmer fully coincides with me in stating that "where there is no moisture, there is no action," yet he has also stated that we "cannot rely on the mechanical perfection of a filling." It has been truly said that "in the hands of a first-class operator ninety-five per cent. of teeth may be preserved with gold; * * * but with an ordinary operator there may not be more than fifty per cent. thus saved." Does not this prove that the success of an operation depends almost entirely upon the capability of the operator?

Pellets and cylinders may do for the stopping up of cavities which are treated as simple holes, and where dental tissue is cut away so as to conform to such filling, but it is not best to have the gold, in such form, cohesive.

for the reason that the difficulty of properly performing operations is thereby only increased; the gold, in such forms, cannot be so easily impacted as when it is not in a cohesive condition. For all *first-class* operations, however, the gold should be cohesive, and be so prepared, introduced, and impacted, that it shall be firmly anchored from the first piece inserted to the last impacted, and so that the filling shall be uniform in density, the gold well packed against the dentine and enamel, and over attenuated edges so as to protect them, and the whole of that portion of the organ which may have been destroyed, properly built out, and finely formed and finished, so that it it may be in conformity with the natural type which was the design of the Master.

DR. CORYDON PALMER: With the permission of the body I wish to be allowed to correct an error in the Transactions of last year. I am represented there to have said, that when we had filled a tooth, we had done nothing more than any ordinary jewelers could have done. It makes me seem to say that which I did not intend to say. What I did intend to say was, that one of our would-be teachers and authors said, or rather asked us the question, "When you have filled a tooth, what have you done? you have done nothing more than any jeweler could have done, and he could have done it better even than you have." I say it is derogatory to our profession, and I do not wish to be considered as having said it; but as it stands on the record it makes me seem to say what I do not believe to be true.

What I would speak to you of this morning is in reference to practice, and I am sorry to see that anything in reference to practice is becoming very unpopular with this body. I have no fine theories, and never attempt to offer them or to discuss them. To me something real, something practical and fine, has been my forte. It has been what I have devoted my life to; and if I offer you anything, I want to offer you something that is fine and practical. The particular point that I wish to bring forward is in reference to restoration of the teeth, or what we have termed contour operations; but more particularly the elongation of teeth when they become shortened by wearing away until something is demanded to stop the wearing and prevent the danger of exposure of the pulps. Some of you may remember that some two years ago, I think it was in June, 1875, there was published in the *Cosmos* some diagrams and views of mine which I would be glad if each one of you would try to find and read, if you have not seen it. Everything is finely represented by minute diagrams, and my views are given more fully than I can give them to you here.

[Dr. Palmer here entered into an illustration by blackboard diagrams of his methods, and exhibited a cast representing a set of natural teeth upon which he had operated.]

DR. HALL: I know that many present have taken some interest in a report made upon the replantation of teeth, for two years past, by Dr. Morrison; and, as many of the cases were mine, and nearly all of them came under my observation, you may wish to know the result. About one hundred cases have been reported in all, and in that number we have had about a half a dozen failures, attributable to perhaps three causes. One is the disturbance of the socket in order to accommodate the replacement of the tooth, where, in order to correct an irregularity, or to force a tooth into the socket beyond the point that it occupied before extraction, a portion of the socket was injured. In the only case that we have had of that nature, there ensued a morbid action that completely destroyed the root, eating out little finely polished cavities, beginning at the apex of the root. Another cause is the destruction of the process in extraction, or in the replacement of the tooth; in the latter case, forcing the bone down underneath, and thus establishing a disorder that could not be cured; and the other cause is the lack of proper support for the tooth after returning it to the socket. The other cases are almost entirely successful, and in fine condition. Two cases of transplantation have been eminently successful; one in which the third molar was transplanted from the mouth of one sister to the alveolus of a second molar in the mouth of another; and the other the exchange of lateral incisors.

THE PRESIDENT: How long since the latter operation was performed?

DR. HALL: About one year. I think the other case was reported at the last meeting. The success attained by this operation, and the good that may be derived therefrom, are truly wonderful. I will refer to the other cases of replantation. One, a lateral incisor, came under my notice when the patient was thirteen years of age. The tooth was black, and I supposed it an ordinary case of a dead tooth. I did not then inquire closely into the history of the case, but upon opening into the root of the tooth and pursuing the usual treatment, I never was able to arrest the hemorrhage; every time I removed the dressing from the root, blood followed, and baffled all effort at treatment in the mouth. I extracted the tooth, and found the root about three-quarters formed. The labial portion of the alveolar process seemed to be entirely destroyed. On inquiry I found that the child had received a

blow from the handle of a windlass at the age of ten, and from that moment development seemed to be arrested. I filled the root with Hill's Stopping, and the opening that I had drilled into the pulp cavity, and replaced the tooth accurately in position, and then allowed the child to articulate the lower ones to that. I saw the patient last fall, and the tooth was doing well. That was four or five months after the operation was performed.

DR. WATERS: Some nine years ago I commenced replanting teeth, and from that time to this, I have at times performed two or three such operations a month. My second operation was in my own mouth, taking out a lateral incisor at eight o'clock in the evening and replacing it the next day at eleven. That tooth did good service for five years; the loss of it was purely accidental: it was broken diagonally across the root under the gum, showing no effect of the fracture for some days, when inflamation came on and gradually that portion of the tooth connected with the crown, loosened its hold upon the socket and dropped off. My next case was the transplanting in my own mouth of a bicuspid. On the 12th of January I extracted from the mouth of one of my own children a bicuspid tooth to allow the canine to come into place. This bicuspid had a slight defect in the crown. I opened through that into the pulp canal and filled the root with gold; placed the bicuspid in a bottle containing water with a small percentage of carbolic acid, thinking I would celebrate my fiftieth birthday by using it. I had a bicuspid which had been broken off, and on my fiftieth birthday I got my friend, A. T. Bigelow, to extract the root. I then went to my office and took this bicuspid from my bottle and placed it up in the socket, and found it was so long on the inner cusp that I could not shut my mouth. I took it out and ground off the inner cusp, and I kept grinding until it fitted, and then I ligated it in place, and it has been a serviceable tooth ever since.

A MEMBER: How long had it been in the bottle?

DR. WATERS: From the 12th of January to the 23d of March.

DR. TAFT: There should be two objects aimed at and attained, if possible, in our profession; the one is the giving and receiving of new ideas, new thoughts, new modes of practice and so on; and the other, and I presume about as important, is the putting into practice that knowledge which we have. There is perhaps as much necessity for this now as for an increase of knowledge, and especially to such men of the profession as are

assembled here to-day. It is desirable to acquire more knowledge—to learn new facts—but it is also of very great importance that we should be stimulated to apply the knowledge we already possess—to live in our daily practice up to the highest attainment which we have made, and to make use of all the auxilliaries at our command to this end. There seems to be a very considerable change indicated in one of the reports, at least from that report there seems to be a turning back to methods and modes of practice of former times, and it is frequently said in our associations that it is time we should retrace our steps and see how far we have gone, and examine the ground over which we have passed.

If we mean by this to go back to the practices of years ago, let us enquire why it should be so? Is the present mode of practice proving deficient and defective? Are we failing to accomplish as much as was accomplished in our practice years ago? If so, it is a sad commentary upon the progress of the times. It is a sad commentary upon the manner in which operations are performed. Knowledge has been increased very greatly during the last quarter of a century, and in general principles, in modes of practice, in therapeutic agents, in modes of treatment, we are almost daily or weekly learning something new, and much of this is better than anything we had before. Instruments and materials used for filling teeth, are constantly being improved.

Under these accumulative circumstances are we going back, failing to accomplish the work as well as a few years ago? If this is so, I say it is a sad commentary upon something. Is it upon our integrity? Then let us be stimulated to use all these things in the very best possible manner. Many criticisms have been made recently upon gold, as a material for filling teeth. Other materials are suggested, amalgam, for instance. There has been an average of one new amalgam a year produced for the last twenty-five years, and each one of these has been perfect; that is it has been declared to be efficient for saving the teeth, would not contract in solidifying, would not oxydize, would save the tooth better than gold. This has been claimed for every new amalgam which has been produced for the last twenty-five years, and each and every one of them at the present time, has signally failed in almost all of these respects. It is true that some amalgams may be made that may be worn in the mouth for many years. Gentlemen say they have seen amalgam fillings worn year after year. That is very true; no one denies it, no one denies but what amalgam fillings will often-times remain in the mouth for years, and seem to preserve the teeth, but is the integrity

of the metal as good as that of gold? That is the question. Where there is one success with this material, I have no doubt there will be many failures; at least that is the result of my experience from the observations I have made. I have no experience so far as manipulating and putting amalgam in the teeth goes. It has been said to me, you ought not to have any opinion about amalgam if you have never used it. I do not think that in order to know anything about this material one must have gone into it to the depths of its degradation; it is not necessary, in order to know something about sin, that we become the vilest sinners. We can see how other people do, and we can come to the conclusion that it is not the best thing. The use of this material is increasing daily, and it is a very sad picture to me to see our profession going back, taking up an inferior material and claiming for it, for the purpose of filling teeth, merits which experience will not sustain.

DR. THOMAS: I would like to call further attention to the matter of replanting teeth, having had some little experience in that direction for the past eighteen months. I have treated between fifty and sixty cases within that time without the loss of a tooth, so far as I am aware; I have replanted all the different classes of teeth, sometimes finding it necessary to cut away a part, or even the whole of the root of a molar in order to be able to return it to its proper place. I will only detain you long enough to recount two cases wherein I regarded the success of the operation quite as doubtful as any I had undertaken at the time. One was the case of a left superior lateral incisor in the mouth of a gentleman about 35 years of age. None of the incisors had ever suffered from decay. The tooth in question had presented an abscess at its roots some five years previous, without any known cause. The abscess had been treated by three different parties without a cure, when he presented himself to me. I found the tooth much discolored and quite loose; it also occupied an angle of several degrees from its normal position, protruding very much; the labial portion of the alveolus was entirely gone, having been completely absorbed some time before. The tooth had been opened into, pulp removed and canal filled—the fistulous opening at the apex had been enlarged from time to time, trephining having been resorted to on various occasions.

After a very careful diagnosis and considering the matter for two or three days, I decided to remove the tooth, and replant it if possible, but with very little hope of success, as the parts about it had become so diseased. Upon removal I found that at some previous time—probably

during one of the trephining operations—the tooth had been cut nearly half off about one quarter of the way from the apex down to the gum margain. I found the filling in the canal good to this point. I cut off the portion above the notch, replaced it—after having cleared away all the diseased portions of alveolus—brought it back to its normal position, and attached it to the adjoining teeth with silk ligatures. About three weeks ago I examined this case and found the tooth nearly as firm as its mate, occupying its normal position and doing excellent service.

The other case I wish to mention is one where a gentleman sent his coachman in to obtain relief. The superior central incisor was abscessed, face very much swollen, and apparently just ready to rupture. I extracted the tooth, and the discharge of pus that followed the operation was simply amazing. Being very enthusiastic at that time on the subject of replanting, I suggested to him—as an experiment merely—to replace it, but his mouth was in such a filthy condition—probably never having seen a tooth brush—that I had not the stomach or the courage to do my duty. I cleaned the cavities and canal as best I could, filled them up with amalgam and replaced the tooth. There was so much swelling in and about the parts that it refused to go properly to place, but dropped down about one-quarter of the length of the crown, but I did not touch it further, not even to put a ligature upon it, which ought to have been done. It became so firm that in three or four months he came back and said the only trouble he experienced was from its too great length, which I corrected by cutting off to correspond with the others. It suggested itself to my mind at that time that in many cases where we have abrasion and the teeth are broken down (either by accident or otherwise,) until there is an exposure of the pulp, the teeth might be extracted and replanted in such a manner that they would present a natural appearance as to length. This could be accomplished by not replacing them as deeply in the sockets as they were originally, and then holding them in position until they become firmly secured. I offer this as a suggestion only; I do not advise it until I have experimented in that direction, which I shall do at my earliest opportunity; but to my mind it is perfectly feasible.

Dr. McDonald: I do not wish to be understood as making excuses for amalgam; at the same time I should be sorry to have it understood as the sense of this body, that amalgam is never to be used. Our friend Dr. Taft informs us that he has no knowledge of amalgam from having manipulated it himself.

DR. TAFT: In the teeth.

DR. MCDONALD: To place myself right, in the first place, I will say that in my practice, perhaps I put in one amalgam filling where I put in one hundred of gold; but at the same time I should feel sorry for a patient who should fall into the hands of an operator who never uses amalgam. I find in the practice and in the predisposition of the dental profession, a tendency to two extremes in this matter. We have extremists on both sides, and I think that both are doing harm. I claim that if a practitioner of dentistry fills all teeth with gold, and uses nothing else, he is liable to do quite as much injury, perhaps, as another who would fill all teeth with amalgam. No one would advocate the latter. I would not, nor indeed filling any teeth with amalgam that can be saved with gold; but my experience has taught me that there is a class of teeth that cannot be saved with gold. There are certain classes of cavities, in my practice, which I do not fill with gold, especially in the wisdom teeth, and some other molars, where I find the structure so poor that it will not compensate the patient for the torture, or if he lacks the financial ability to pay for a large operation in gold; yet I claim that gold is the best material for filling the best teeth.

DR. MORRISON: [The following extract is taken from a letter from Dr. Morrison, which was read by the Secretary.]

"Of sixty-seven cases of replanted and transplanted teeth reported to this Association, taken as they come, ages ranging from eight to sixty years, with constitutional and physical conditions varying nearly as much, I have to report the loss of five replanted teeth. Case No. 3.—Because the peridental membrane had been enveloped by a thin scale of tartar years before it was operated upon. The tooth was retained in the jaw, however, over one year. No. 10.—Had its root nearly absorbed off, chiefly on the buccal side. It was retained in the jaw about two years, and stood very firmly until a few weeks before it was extracted. No. 24.—Root much enlarged by exostosis; retained but a few weeks. No. 26.—Outer plate of the process fractured in extraction. The tooth gained some stability, and was used one year. No. 56.—Had some cavities absorbed in the roots near the apex, and also near the cervical margin.

"New cases replanted since last report, eighteen; transplantation, one, viz.: the left superior lateral incisor; a descriptive history of which I had intended to present this year."

DR. BARKER: I am glad that the letter from Dr. Morrison has been read for our instruction, for it seems to me that we are rushing somewhat blindly into this practice of transplanting and replanting teeth, and that possibly some disastrous results, which we do not anticipate, may follow. I would say in regard to the method of lengthening teeth suggested by Dr. Thomas, that this can be accomplished much better by means of ligatures which will gradually draw them from the sockets to any desirable degree, and osseous depositions will form around the roots, and retain them in place. It was unnecessary to cut off the protruding tooth in the case he referred to, because it could have been readily forced back to its former place with properly adjusted ligatures.

Success in replanting teeth cannot be expected unless provision is made for drainage. An opening should be secured for the escape of the fluids in the alveolar socket, whether the tooth be in the upper or lower jaw. I have had long experience in replanting teeth, some of which has led me to regard the practice with distrust. I have no doubt, however, that in a large majority of cases this operation may be successfully performed; but much depends upon careful manipulation, and the extent of the injury sustained by the surrounding parts in the extraction of the tooth.

DR. ATKINSON: Whenever we can get perfect adaptation of any indestructible material to the walls of a cavity that has been cleansed from all the disintegrating and soured substances that are in process of retrograde metomorphosis, and so seal it up with anything that is indestructible by the fluids of the mouth, we have to all intents and purposes saved the tooth. Then we have the question as to what best accomplishes this; whether soft plaster, and such trash, can be put in so as to exclude moisture more successfully than any substance requiring the delicate perception, and manipulation, and dexterity that gold requires. And when gold is put to its proper place does it not pre-eminently fulfil the conditions that I have spoken of? Is it destructible in the mouth? Is it not absolutely indestructible in the mouth by any currents that we know of. that can act in the mouth without destroying its entire tissues? I think it is want of mental perception and clearness of comprehension that makes any one advocate a fallacy. Let us see where the fallacy is, anod see whether we are wiser than the original architect of the human tooth. What then is the proper method of restoring a decayed tooth, but to clean out all the disintegrating material, and put something there that shall be anti-zymic in its nature—anti-fermentive—a friend at court, and then fill so

as to restore the contour of the tooth, that its ghost may have the same sized house of the new material, to live in, that it had in the material that it built itself; and then we have a restoration; and if that is not contour, I do not know what contour means. I do not mean contour of the tooth if it were worn down, because it would never do to restore such a tooth to its normal shape, and let it bang away against its opposing one, when it has been worn down to a certain level.

DR. ALLPORT: The impracticability of treating aveolar abscess of long standing and restoring the parts to a healthy condition, having been somewhat questioned here, with the permission of our President, I will state that at the time of the meeting of the American Dental Association at Detroit, he showed me a case of some twenty-two or twenty three years standing that he had successfully treated. The case was a central incisor, over which an abscess had not only formed and discharged through the gum, but there had also been a profuse discharge into the nasal cavity. The case had been treated with carbolic acid and when I saw it, the abscess had healed, and the parts were in a healthy condition, and I am assured that they remain so at the present time.

Of course carbolic acid cannot always be relied upon in such cases, but when it will answer, it is as well not to resort to more powerful agents. Sometimes sulphuric acid or aromatic sulphuric acid will meet better the requirements of the case, while in other cases, mechanical means are required. In my judgment, it makes very little difference whether the abscess be of recent or long standing, provided the treatment is such as to remove all diseased tissues, and the parts are left in a condition to take on healthy action. This done, nature will soon restore the lost parts and the cure will be complete. It will make little difference what is done so long as necrosed bone or rough and sharp surfaces are left, for so long as either of these conditions remain, a healthy condition of the parts cannot exist.

One word in regard to the replanting of teeth. That teeth can be successfully replanted and retained in the mouth for a few years, I have no doubt, but that they will as a rule remain there in a *healthy* condition for a great number of years, I do not believe. The question in my mind is not whether they can be replanted and kept in the mouth for a few years, but will they remain in a healthy condition for a considerable length of time—more than a few years. The replanting of the teeth is by no means a new idea, either in this country or in Europe. My first experience in

this practice was some twenty years ago, an account of which was at that time reported by one of my assistants for the Dental Register, under the title of "Just to please his Mother." It was the case of a boy some seven or eight years of age, who had one of his central incisors torn out while hanging to a swing by his teeth. When the boy's father brought him to to me, he made the remark that he did not suppose it would do any good to put the tooth back in its place, but he wished I would do it "just to please his mother." The tooth had been out say an hour and a half. I syringed out the socket and washed off the tooth and adjusted it in its place, securing it to the adjoining tooth by a silver wire. In a few days it had united with the socket, but after a few months, an abscess had formed over it. I drilled into the pulp cavity from the lingual service, cleansed it out, and filled root and crown with gold. The abscess soon healed. The color of the tooth remained remarkably good, but after a few years the root at its apex became entirely denuded and protruded through the gum, irritating the lip so much that I cut it off and polished it down to prevent the irritation. In my experience, I have met with several cases of replanted teeth, and I have seldom seen one where the parts around retained a healthy condition after a few years, and I do not believe that a general practice in replanting teeth should be adopted.

DR. JOHN ALLEN: I have replanted teeth when they were very sensitive. During the whole operation the patients declared that they had not suffered nearly as much as if the tooth had been excavated while in the mouth. These teeth have done well for many years, more than ten I know. I dislike the plan of narrating individual cases, but I will refer to one simply. A boy had his teeth knocked out from a kick by a horse; the four front teeth remained in the sand some two hours. Those teeth were washed in warm water, cleansed and returned to their sockets, fastened with ligatures, and to my knowledge for twelve years after, were good substantial teeth, and retained their natural color.

DR. THOMAS: Were the pulps taken out?

DR. ALLEN: No sir; that is another point that I wish to speak of. I contend that it is an important point to retain the pulp in the tooth; that the vessels of the pulp may reunite at the apex of the root. I believe they do this, from the fact that we see the color retained in the teeth perfectly, and I believe there is a good healthy circulation going on through such a a pulp, after the tooth has been replanted in that way.

REPORT

ON

DENTAL EDUCATION.

By THOMAS FILLEBROWN, of the Committee.

I shall confine my report to the consideration of the following points:

Dentistry a specialty in medicine;

A thorough medical education essential to the most successful practice of it;

The expediency of existing medical schools including dentistry in their courses of instruction;

An account of some action that has been taken by several societies in regard to dental education, and some suggestions as to the action this Association should take in regard to the matter.

That dentistry is a specialty in medicine needs no argument here, for it is written in the preamble of our constitution, and embodied in its articles, and endorsed by almost every individual member who has spoken before this body, or written an article for its edification.

That a medical education is essential to the practice of dentistry, has not, I think, been so fully endorsed by this Association, although it seems but a corollary of the former proposition. It is with reluctance that I reproduce the arguments to sustain that proposition. They have been presented many times, and ably, and are well understood, and I wish I might add, their force fully appreciated. But so long as the proposition is not actively, as well as passively, endorsed, these arguments will be in order. As I understand the use and significance of a medical education, it is not that a graduate leaves his *Alma Mater* as well fitted to practice any branch of his profession as he ever will be, but rather that he has just become well fitted to begin to perfect himself in the profession he has chosen, or whatever branch of it he may prove himself best fitted for. I presume no dentist in this Association, nor out of it, nor any individual of the public whom we serve, will for a moment question the propriety and need of a very thorough medical education for the specialist practicing ophthalmic surgery; nor does any one doubt the healthfulness of the public opinion that compels every one who would be a respectable practitioner in diseases of the eye to first obtain an education guaranteed by his degree. Although much good might be done by a conscientious ophthalmic surgeon who knew nothing else, yet in this case every one present realizes the evil that would follow a state of public opinion which would tolerate uneducated practitioners in this department of medicine. Surgery of the eye and of the teeth are as intimately associated with each other and with the welfare of the whole system, as the eye and maxillæ are close in anatomical relations in the human face. Inflammation of the dental branch of the fifth pair of nerves differs in no respect from that of the ophthalmic branch. Ulceration of the mucous membrane of the mouth is in no wise different from ulceration of the mucous membrane of the eye. Congestion of the periosteum of a tooth is the same as congestion of the periosteum of the humerus. Necrosis of a jaw and of the supra-orbital plate differ in no respect; and the treatment in each of the above cases should be governed by the same principles, and similar remedies applied, and the same education is necessary for their intelligent application.

It is, I believe, conceded by every one that, other things being equal, the person who has the medical education is best fitted for the practice of dentistry, as well as other branches of medicine. I was deeply impressed with the force of this at a meeting of one of our leading dental societies. During the discussion of a paper presented by one of the best educated dentists in the country, the question arose as to his correctness in regard to some deleterious local influences which he mentioned. The reply was short

and decisive: "He is an educated physician—has practiced medicine, *ergo*, is *particularly* well qualified to judge;" and no more was said on that point. This is indicative of the opinion of every dentist and of every individual in the land.

When a medical graduate attends a succeeding course of lectures at a dental school, the respect that is paid by both fellow-students and teachers to his acknowledged superior acquirements, is very noticeable, and, also, the certainty with which his passing his examination is assured, or, it might almost be said, passing without examination. This feeling is entirely reasonable, for the greater includes the less, and the medical graduate needs only to be perfected in the handiwork and technicalities of his specialty to be thoroughly qualified for the commencement of its practice.

Another fact of importance and worthy of consideration is, that the minds that have been active, influential and efficient in elevating the practice of dentistry to its present perfection, and in improving and enlarging the mental culture of our members, and that have done most towards forming an exalted and healthy public opinion in regard to dentistry, are, as a rule (with some noble and notable exceptions), the minds of medically educated men. The standard literature on dentistry is the product of the same class of minds. I find no fewer than sixty-eight volumes and monographs mentioned by different authorities as having attained in their time, to more or less authority as standard works on dentistry. Of these sixty-eight, fifty-two were written by graduates in medicine, sixteen by all others, and these of much the less importance and scientific value; and of the present standard works on the subject, the same large majority are the productions of medical men.

Another statement of the argument is this: Dentistry is a science requiring anatomical knowledge; such knowledge can be obtained in no way sufficiently without dissection of the parts operated upon. A student cannot be competent to dissect the head of a subject before he has the practice incident upon the dissection of the other parts of the body; therefore, no less than a thorough knowledge of anatomy will suffice. The same will apply in regard to Physiology, Chemistry, Pathology, Therapeutics, or Materia Medica. If a student will spend the same time in the study of the general principles of medicine as is commonly applied to dental specialties, he may become well versed in all branches of medical science, and then he will be able to pursue his special studies understandingly at his leisure. He cannot understand the whole without understanding the part. By attention

to the part only, he not only fails of the whole, but his knowledge of the part is limited and uncertain. It is needless for me to add that a practitioner to be a good *specialist* must first be a good *generalist*. A dentist may not be required to operate for strangulated hernia, perform ovariotomy, or ligate a femoral or carotid artery; neither may the ophthalmist or the aurist; yet I do not presume any member of our profession will claim that there is any better course for the latter to pursue than the full course duly ordained by our medical schools. Is not the operator who treats abscess, ranula and necrosis, excises tumors, and resects the maxillæ, in as much need of medical knowledge as he who cuts for cataract or enucleates the eye?

Obstetrics has been objected to as less necessary to the dentist than any other branch of medicine; but when it is remembered that during gestation, from conception to delivery, there is an immediate and constant change in the dentinal structures, and that during lactation there is a continual tendency towards disintegration, and that the dentist is continually called upon to operate upon the teeth of patients with these circumstances existing, will it be presumed that any needless knowledge of this subject will be acquired in an ordinary medical course?

The subject of anæsthetics needs only to be mentioned for every one to fully appreciate the importance of a thorough understanding of it. The nature of anæsthetics and their physiological action, normal and pathological, demands the most thorough knowledge of all the means to remedy their unpleasant or injurious action, and of all the measures for resuscitation from their excessive influence.

While the fact still remains that dentistry consists very largely of essentially mechanical operations upon the teeth, so far from this being a reason for less preparation, it is the strongest argument for the more thorough and extended preparation. Specialties tend strongly to run a practitioner in grooves, and the more of routine a specialty is, the more the need of the antidote.

The expediency of medical schools including dentistry in their courses of instruction may well receive from this Association a larger share of its attention; its importance seems to demand it. That such a course would be both expedient and wise, appears for the following reasons: More schools are needed, and more widely distributed, so as to offer more ready facilities and greater inducements to young men to obtain a good education before entering upon the practice of dentistry. Fewer schools and better, have

been advocated, that better instruction might be given. If such a result could reasonably follow, it might seem well, but the professors of existing schools are among the best men in the profession, and as many more can be found at call that will make equally good instructors, so there exists no lack of talent for professors. No one would think of increasing the aggregate number of attendants of common schools, academies, and colleges, by lessening the number of schools and colleges and instructors, but the rather where a few more scholars can be gathered together, there build another school-house.

Wherever a professional school of any kind is located, there will exist a higher standard of professional excellence, and an advanced public opinion upon the subject, and a keener appreciation of its worth; so wherever a dental school is established, there will be found superior operators and superior patients.

Increasing the number of dental schools does not lessen the attendance at previously existing institutions. The Baltimore college did not suffer by the opening of a school in Philadelphia, nor did the latter suffer in attendance by the establishing of one in New York City or Cincinnati, nor these by schools more recently opened; neither would any existing dental school suffer any lessening in its number of students should the door of every medical school in the land be opened to dental students to-day. The fact that not more than one in every six of the dentists of this country have had the benefit of any instruction outside of their preceptor's office, speaks more forcibly than I can write, for the necessity for greater facilities for professional education.

The faculties of our dental schools as a whole, are deserving of all honor for the faithfulness with which they have discharged their duty to their students, the profession and the public. They have advanced as fast and as far as the profession behind them would rally to their support, and have turned the examination screws upon their students as hard as they would bear, and I would be the last to cast a stone, but would rather seek to be an Aaron or a Hur to lift still higher the hands of each Moses, that they may lead the profession to greater victories.

The proposition to advise the including of dental subjects in a regular medical course, implies no reflection on our dental schools or their instructors, but the opposite. The advancement they have already made is, in including

more and more of general medicine in their courses of instruction, and in that direction it still must lie, until, sooner or later, they too cover the whole ground; and to this they are sure to come.

A thorough course in dentistry, according to the prescribed curriculum of our colleges, covers a term of three years, and a medical course the same. The ideal dentist will first graduate in medicine, and then take a post-graduate course in dentistry, making the whole term four or five years. But very few will do this, and for the present the profession will have to be content with the one or the other course. A course in medicine costs no more in time or money than one in dentistry. During the three years of a medical course there is ample time for a student to become familiar with the specialty of dentistry, or any other he may choose to practice.

The operative skill of the many dentists now practicing, whose preliminary qualifications are a medical education supplemented by an office practice only, is abundant evidence of the truth of the above proposition.

The few mechanical principles which govern the operation of filling a tooth can quickly be understood, and not many months of constant practice are requisite to acquire the art of their application. The same applies to artificial work. I mean such a knowledge as a student is expected to have at the commencement of his practice; the more perfect ability of the older practitioner can come only by assuming responsibilities, and overcoming difficulties by expedients developed from his own resources. I appeal to the experience of the very large proportion of dentists practicing at the present time with a preliminary studentship extending over practically less than one year, for evidence of the truth of this statement.

With the general medical principles involved in the practice of dentistry, the case is different. It is only by a prolonged effort extending over several years, that these can be required and understood in a sufficient degree for an intelligent application. And again I repeat: No amount of study of Dental Anatomy, Dental Physiology, Dental Pathology, Dental Therapeutics, Dental Hygiene or Dental Histology, will suffice to give a student more than a partial culture of which to boast, or by which to be benefitted. But let him master *general* Anatomy, Physiology, Pathology and Therapeutics, and the other branches of a medical course, and the special knowledge required, will be found contained therein, and will as naturally grow from it as the vigorous plant from the seed planted in fertile soil.

One more reason: Every person who studies dentistry is not well fitted by natural abilities for it, and if he possesses the liberal culture of a medical education, he is well able to correct the error of his youthful enthusiasm and seek some other branch of practice better suited to his abilities and tastes. On the other hand, if the principles of Dental Science are brought to the attention of medical students, many a man who might otherwise pass through life only a tolerable doctor, might become a brilliant dentist, and others whom nature had endowed with superior surgical talent, but circumstances offering no opportunity for their use, might find in dentistry a wide field for their development and exercise.

Will the medical profession take sufficient interest in the matter to extend their sympathy and support to such a cause, and will medical schools adopt such a plan, if requested?

Let the following history of a movement in this direction be the answer: At the semi-annual meeting of the Maine Dental Society, in February, 1876, resolutions were unanimously passed declaring a thorough medical education essential to the most successful practice of dentistry. Also, that it is expedient and for the best interests of all concerned, that existing medical schools should add efficient instruction in dentistry to their curriculum.

At the semi-annual meeting of the Merrimack Valley Dental Association, held in May, 1876, after a full discussion of the subject, resolutions expressing the same sentiments were passed by a unanimous vote.

The subject was brought to the attention of the American Academy of Dental Science, at their annual meeting in September, 1876, by a paper read before them, and upon taking a vote, the Academy unanimously endorsed the same resolutions and recommendations.

In December, 1876, at a regular monthly meeting, the Cumberland County (Maine) Medical Society considered this subject and without a dissenting or doubtful voice in the discussion or vote, declared for a more thorough education for dentists, and for affording medical students instruction in dentistry that they may not be debarred from entering the practice of so important a specialty of medicine. A committee was chosen to consider what action the society should take, and at the following meeting in January, 1877, the following report was made and adopted:

"*Whereas*, Dentistry is and should be regarded as a branch of the science of medicine, Therefore,

Resolved, That it is the duty of those having charge of our medical schools to see that suitable provision is made whereby all students attending the same may receive such instruction in this special branch as shall qualify them to commence its practice on their graduation.

Furthermore, we would advise that this subject be brought before our State Association at its next annual meeting, that it may take such action as it may deem advisable."

As a sequence of this action, the Portland School for Medical Instruction has added to its corps of teachers, Elbridge Bacon, M. D., for thirty years practicing dentistry, instructor in that branch.

The same committee was continued, to bring the subject to the attention of the Maine State Medical Association, and at its annual meeting last June the following action was taken:

"*Resolved*, That it is for the interest of the medical profession of this state that provision be made at the Maine Medical School whereby those students attending the same may receive such instruction in the special branch of dentistry as shall qualify them to commence its practice on their graduation."

As a conclusion of this report I offer the following preamble and resolutions for consideration by this Association, hoping they may pass by a vote as unanimous as those previously quoted:

Whereas, Dentistry is a specialty of the science of medicine,

Resolved, That we esteem a sound and thorough medical education essential for the most successful practice of it.

Resolved, That we deem it expedient and for the best interests of the profession of dentistry that existing medical schools enlarge their courses so as to include efficient instruction in dentistry, in order that it may be placed on an equality with other specialties of medicine.

[For action thereon see page 27.]

REPORT

ON

DENTAL EDUCATION.

By J. N. CROUSE, of the Committee.

Probably no subject connected with our profession has been so much written upon and discussed within the last few years with as few practical results as dental education. Reforms are needed, and if they are not brought about by this representative body, where shall we look for them? Our profession is constantly being filled up by a class of men who aspire to a profession, who have neither the brains nor the application to prepare themselves for professional work, hence they choose the dental above all others, as involving the least amount of time and exertion in preparation.

The subject of requiring a better preliminary education, both general and professional, on the part of those entering our ranks—how it can best be enforced, and also attained—is discussed and urged in our societies and journals from year to year, and with some good results. Still each year sees an increasing number of unqualified practitioners, with hardly the first principles of dentistry, entering the field to prey upon an undiscriminating public, and heap disgrace upon the profession. A large proportion of these have never attended a medical or dental college, nor had proper office instruction, and yet they take and hold a position alongside of the dental graduate, enjoying,

in many instances, the patronage of as intelligent people and as remunerative a practice. As fast as their patients discover they have been wronged, there are new victims ready for the slaughter. How is this growing evil to be remedied? A move was made in the right direction by this Association at its meeting two years ago, in so amending the constitution as to receive no delegate who enters the profession after that date, without having graduated at some reputable dental or medical college; also in the resolution passed recommending to local societies the adoption of rules prohibiting their members from taking students for less than three years. The Illinois State Society adopted this rule as an amendment to its constitution in 1873, with the addition that the preceptor require the student to give a written obligation to graduate at some regularly organized dental college, before he assumes the responsibility of a dental practitioner. But it remains for our colleges to strike still deeper at the root of this evil. Some of them have taken an advance step in adopting spring courses, the attendance on which, however, is left optional with the student. One of them has progressed still farther, in combining the two terms and compelling an attendance of an eight months' course. In order to enforce these rules upon the student, the advantages which our colleges offer, must be so great that students will feel that they cannot afford to do without them. But how are these advantages and facilities to be increased? We believe that our colleges are already doing all in their power, inadequately supported as they are.

Your committee on dental education for the year 1870, reported in favor of lessening the number of dental colleges. They urged that a few educational centers placed on a good financial basis, with ample facilities and appliances for instruction, and a complete corps of eminent professors, well compensated for their labor, could offer advantages to the dental student which our present schools cannot; that the colleges were too numerous to be well attended, and were hampered by limited facilities, and sustained largely by overworked professors, who gave not only their time, but largely of their means for their support. At that time there were nine dental colleges, with an average of three or four graduates for each professor. Since then the number of colleges has increased to twelve, with several more in an embryonic state. Your committee has not learned that the patronage has been so great as to demand or encourage this increase. The question arises, why are new colleges formed, to still farther hamper those already in existence and so poorly sustained? Are the projectors of each new college so philanthropic that they, too, are eager to make sacrifices for the profession? In short, is it to further the interests of the profession or to benefit the projectors? If they can offer increased

facilities for learning to the student, they do indeed benefit the profession; if they cannot, they are only hindrances to its progress.

There is probably no profession of which the public generally are so little informed as the dental, and in regard to which even the intelligent classes can be so readily deceived; therefore we must put a wider difference between the graduates which our colleges send forth, and those who are entering upon practice without the necessary preparation. We must make the standard of education in our colleges so high, and the examinations so severe, that to be a college graduate will mean something; that to be known as such will insure respect and inspire confidence in the mind of the public. Then will there be less temptation to young men to be dishonest, and a greater incentive to qualify themselves before entering upon professional work. Now while all honor is due to those who have toiled faithfully and conscientiously in our colleges, and have indeed sought to advance the interests of our profession, we long for the day when our dental schools shall be so manned and equipped, and the professors occupy such a position that they can instil in the minds of their students a higher appreciation of professional conduct. At present too large a per cent. of our graduates resort to unprofessional conduct as means of getting business. The instructors in our dental colleges should take special pains to guard this point.

Again, the selection of students is of the utmost importance. Let the requirements and advantages of our colleges be unsurpassed, and it avails nothing with dunces for students. A reform is needed in this direction, but difficult to make, from the fact that a large share of the students are taken by incompetent practitioners, who are not associated with any of our societies, and hence are beyond the control of the profession, or any restrictions that otherwise might be put upon them. Nothing short of legislation can reach them. The selection of students by this class of practitioners is generally purely mercenary, the object being to secure the services gratuitously, of an assistant and servant combined, and in many cases a fee besides. Prompted by such motives, they do not seek for intellect, or a high order of talent, for to such, the work of taking care of his preceptor's horse and cow, running of errands, collecting his bills, etc., would soon become monotonous, especially when he is paying for the privilege of doing it. Then, when doing the plaster work, finishing up rubber plates and polishing instruments, constitutes his laboratory instruction, and washing the dam, doing the malleting and keeping the office in order, his office instruction, the young man of any ability soon concludes

that he is being imposed upon; especially when he receives no other instruction. So young men of ability are rarely chosen to the position. The dolt who can be wheedled into the belief that he has only to perform these services faithfully for a few years, when he will come out a proficient in all the branches of dentistry, answers the purpose better. It may take the preceptor longer to teach his student these fine arts, but, all things considered, stupidity is an indispensable qualification. Dishonesty is not *always* the cause of such selection of students. The great need of our profession is, better material for dental students—the selection of none but young men of ability, who have the physical strength and general adaptation necessary for the calling.

Probably no one thing has conduced so much to the advancement of the profession at large, as Dental Societies. The clinics held in connection with them have been a power for good. Your committee think the practice of selecting and sending out a list of subjects for discussion without first getting papers pledged on each, a mistake. Each subject should be presented in a well-digested paper by some one who has given it thought, thus bringing the subject before the body in such a manner that it will take a wide range of discussion. The committee, or those having this matter in charge, should look well to this, and get papers pledged on each subject proposed for discussion, thus insuring a life and interest which otherwise will not exist. But with all that our societies can do and are doing, we cannot hope to be recognized by the other learned professions as an equal, until our colleges rest upon a different basis. But how to effect the change is a problem difficult to solve. Two great obstacles block the way, viz.: the multiplicity of colleges now existing, and the lack of means to place them on a good financial basis. If the first obstacle could be removed, it would greatly lessen the importance of the second; for the divided and sub-divided patronage which our colleges now receive, if given to the number of colleges actually needed, would place them on a firm financial footing. If the compensation then received from students, was not sufficient to amply repay the instructors, other means should be employed; for our colleges should receive the time and energies of the best talent in the profession.

We would suggest two other plans for improving our finances, for your consideration, viz.: endowments and state appropriations. If the number of colleges were reduced, the standard of collegiate education raised, and proper effort put forth, we believe endowments could be secured for such institutions. It might be more difficult to secure them in a profession like

ours, limited as to numbers and means, but if our colleges ranked with the best institutions of learning, as they should, wealth and patronage outside of the profession could be enlisted. But the more feasible plan, and one which we believe will ultimately be adopted, is, the securing of State appropriations. To the State of Michigan belongs the honor of being the first to make an appropriation for dental education.

We have said that our colleges should rank above the best institutions of learning; and why? For two reasons: until they do, and the graduates they send forth are superior to those of other schools, our profession will not receive the recognition which it desires; secondly, in an occupation so taxing, as ours, when once engaged in active practice, there is neither time nor inclination for hard scientific study; therefore the preliminary education should be more thorough, the foundation broader and deeper.

We respectfully submit this report, with the hope that this question of Dental Colleges, which is of such vital importance to dental education, may be discussed and rediscussed till some revolution shall be effected which will place our dental colleges foremost among educational institutions, and our profession in the front ranks of scientific bodies.

DISCUSSIONS.

DR. ATKINSON: With reference to the difference between a dental and medical education, there is only the difference between the human body and any one of its members. Until we can breed teeth without breeding them in connection with the whole system, we must acknowledge the unity of the body as not complete without the teeth, and not understandable unless we comprehend their connections and sympathies; and this mere verbiage of saying that there is a dental profession, as distinct from a knowledge of the science that underlies the ability to diagnose the cases—to prescribe the remedies, or execute the work, is sheer nonsense.

DR. TAFT: I know of no dental profession such as Dr. Atkinson has alluded to, nor dental education that is not based on medical science.

DR. SPALDING: That there is a *dental* profession distinct and *diverse* from the medical profession, I think no one will claim. Having failed to get what we have wanted, we are casting about to see what shall be done in the way of improvement; and, I believe this is the spirit that animates every man who thinks aloud on this subject. It is a very easy thing to beautifully paint with the pen a certain dental millennium, which no man of this generation will live to see, but the question is, how can we realize any such chimerical idea, for I cannot call it anything else; it is wholly impractical, and its realization is beyond the reach of the present generation, at least. Then, in making up our classes, we must make use of such material as now presents itself, for we cannot create it. If we make an ideal man, we make a very different one from the average of those that now present themselves. We can only select individuals from the mass of material at our command. And, when the time of graduation comes, we must set our standard of examinations at the very highest practical point attainable under our present conditions. We cannot expect young men to acquire knowledge without facilities, and therefore we must endeavor to prepare for them the best facilities we possibly can. I undertake to say that our medical schools, as at present constituted, are not the best means; hence there is only one opening left to us, and that is, to teach medicine in our dental colleges, from a dental standpoint. We do not propose to omit medical knowledge—do not propose to omit one single thing, not one iota of knowledge that is requisite for the dentist, but we propose to teach it from a dental standpoint. Our own individual experiences enable us to understand, much better than can a medical man, what is most requisite for us to know. If a dental student could comprehend and embrace the whole circle of knowledge, amen! say I. But if he is to be limited, and only able to comprehend a portion, let him have the most essential parts first, and then infuse into him a determination to make his studentship endure so long as life lasts, that he may constantly improve in that direction. No man's education is finished in a college; he must educate himself so long as he lives.

DR. BARKER: I have gotten entirely over this sickening sentimentality which prompts us to claim fellowship with a profession that utterly disclaims us. Let us become practical dentists, proud of the occupation, and not ashamed, at all times, to defend it and claim for it an

equal position with any other. I have only this to say with reference to some portions of the essay: it is perfectly natural and just that men young in the profession, knowing nothing at all of teaching, and the requirements of students, and having not the slightest conception of the material presented, should advance the utopian idea that a complete medical education ought to be acquired by dental students; and they ignore the fact that both of these would have to be acquired in the same time that is usually allotted to either one of them. We all know the tendency at the present time to division of labor and technical instruction. The University of Pennsylvania is now attempting to introduce special branches, to which special attention shall be given. Colleges abroad recognize only a few of the American institutions, and why? Because they are ephemeral, and they spring up like mushrooms. We all find that the more rapid the growth of the vegetable or animal, the more likely it will be to disintegrate and pass into certain forms of retrograde metamorphosis. The trouble is, that you ask colleges to do more than you are doing yourselves. Are the best men in the profession upholding the hands of your representatives? The colleges are the mouthpieces of the profession. I have had experience with medical men, and have seen very many start out with medical degrees, and afterwards take dental degrees. I say such men in my experience do not make as good dentists as if they had been thoroughly instructed in a dental college, and had received a dental degree first. I agree with one of the speakers who says there are too many colleges, and would like to see all the dental colleges wiped out, and two colleges established; and would have no one fill any chair unless he be a practical dentist.

Dr. Judd: This is a subject that should receive more attention than it has formerly, from this Association. There seems to be very diverse views with regard to several points connected with this discussion. We will, however, take it for granted that a large majority of the members of this Association are in favor of a high degree of learning. That seems to be a point upon which they may all meet; but the great point of discussion seems to be, how shall this be acquired. While one man says that in his opinion, medicine should be taught by dentists, another believes that medicine should be taught by medical men. I will not deny that there are dentists in this Association that are able to teach medicine, to a certain extent, but it would be very strange indeed if they should be better qualified to teach it than those who have made this the entire study of their lives. It would be equally strange if our young dental colleges could teach medicine better than colleges that date back for centuries, and have brought to their

assistance the best talent, the largest learning, and the greatest experience that can be found in this or any other country. Again, is it necessary for us to know anything about medicine? Then comes another point: shall all of our learning be from a dental standpoint, as has been stated? During the past three or four days the most of our time has been consumed in the discussion of medical subjects—subjects which are connected with the treatment and the cure of disease. These are what we need the most, to complete our dental education. The manipulations are taught in every little Association of dentists throughout the land, and the general theories connected with them are well understood. But these medical subjects, less understood, have been found of so great importance that we have given almost all our time to their discussion. In my first valedictory before the graduates of the Missouri Dental College, I stated, that so far as medicine and dentistry go together, it is well to make use of the learning and the experience of the medical teacher; and when we diverge from that, let the dentist furnish the dental instructions, teaching dentistry just as any other specialty is taught. I must confess that my experience with medical men is widely different from the experience of my friend Dr. Barker. In the relations of life, wherever I have met them, I have been treated with as much courtesy and kindness as I have ever been by the members of the dental profession.

Dr. Barker: I did not refer to any social relations—these are of the most delightful nature—but of professional.

Dr. Black: In my opinion a dental student should study Anatomy, Histology, Physiology, Pathology, Therapeutics, Chemistry and Surgery. Are not all these subjects taught as well, and better, than we can hope to teach them in purely dental schools, in our medical schools that have been in existence for years, and where the best skill in the world is concentrated? What do we want besides this? Metallurgy and mechanics. Does not that complete the course? Can't it all be placed under these general heads? If we are going to cut loose from the medical profession, we must reduce ourselves simply to mechanics; that would be the necessary result, for we are medical men, or we are mechanics. The surgeon is necessarily more or less a mechanic. If we are going to be mere fillers of teeth, let us say so, and give over the treatment of disease to medical men; otherwise let us prepare our students for its intelligent treatment, and I know of no better place to acquire a qualification for this than in a medical college.

DR. INGERSOLL: As I understand the report which has been read, it proposes to ask of the medical profession a practical recognition of dentistry as a specialty of medicine, at par with the specialties of the surgeon, the oculist and the aurist. Regard dentistry as *we* may, it is not *in fact* regarded as a specialty of medicine. As a practical science it is nowhere found in text-books of medicine, and is wholly ignored by the medical faculty. The science of medicine in its broad and true sense embraces the entire human organism, and takes cognizance of all its physical relations. It therefore *technically* includes dentistry, while it practically ignores it. If now it shall extend its college curriculum and teach dentistry as a specialty, like the specialties of the surgeon, the oculist, and the aurist, the community will consider the graduate from the medical school as well qualified to practice dentistry as surgery—as well qualified to treat the diseases of the teeth as the diseases of the eye. The many hundreds of graduates from the medical schools of our country would go forth as practicing dentists, and the dental profession as a distinct body would be swallowed up, and cease its separate existence; I am not yet prepared for this.

DR. FILLEBROWN: In the time allowed for my report I could not presume to rehearse all the arguments relating to the subject. Medical schools are not at the present time so constituted as to properly instruct in dentistry. That they must be reconstructed there is no question. It has never entered my mind, nor have I ever heard it intimated, that any person not in the active practice of dentistry should attempt to give instruction in that branch. The same does not apply to anatomy, materia medica or chemistry. If a person well understands general anatomy, and wishes to pursue dental anatomy as a special study, he has already the basis from which to start. With regard to over-education, I believe there is such a thing; but is three years an over-education? Not by any means. In this country this is the minimum amount of time that is usually spent upon medical education before graduation, and I do not believe that Prof. Huxley, or any one else, thinks that an over-education.

DR. ATKINSON: He takes seven years as the minimum.

DR. FILLEBROWN: I want no sudden growth of new schools. I speak of medical schools enlarging so as to include dental instruction, because they would not be new schools, but are old schools well founded upon the respect and confidence of the public. Why should not the medical schools of Chicago, for instance, which are well established in this

community, well supplied with property, with appliances, and with intelligent and skillful professors, add to these, instructors in dentistry, and thus include this important specialty in their courses? They have only to issue the call, and the goodly city of Chicago will forthwith furnish practicing dentists well worthy to be associates in their labor.

DR. CROUSE: It strikes me that the question for us to consider is not what the medical profession are doing—not how many quacks they may send out, nor how efficient the medical student may or may not become—but rather what we ourselves are to be. The medical schools are so numerous, and the competition so great, and the talent employed in them is so small in many instances, that we do not find in them just what we want for our dental pupils; so I do not care much about discussing the conveniences of these institutions. I have known practitioners of medicine in the country wholly incompetent, and such is the case in all professions. It is absurd to talk about general practitioners being able to treat the eye, or the ear, who cannot, as young graduates, treat anything properly. Some after several years' experience and through many mistakes, acquire a fair degree of skill, and have ambition enough to go on and finish their course of study in some more reputable schools; while a great many others get disgusted with their blunders, and go at something else, and it is a good thing for the community that they do. That is the general history of medical education in this country. There are, however, some grand exceptions. We have a few medical schools which send out their pupils well prepared. That is what *we* want. There is one question I would like to ask of any practitioner here who has been in practice long enough to find out, namely, if he had his course to take over again, whether it would be a less or a more thorough one. If they feel as I do, they would say it would be very much more thorough; they would not be in such a hurry to get into active practice.

DR. SPALDING: We would infer from the tenor of the arguments which have been advanced upon this subject, that the advocates of dental schools are opposed to medical education. It is the most absurd position that ever was assumed, for there is no dental educator in this land who is not a friend to education in medicine, and who does not insist that every student in the dental schools shall be educated in medicine just as far as it is practicable—not what we would desire, not what we some day hope to see, but what is practicable. At the present time we have got to take things as they are, and make the best of them. If we could change our circumstances to suit ourselves, we would have a very different condition of things, and

would insist that every student should take a complete course of both medical and dental study. This is now possible to only a few, therefore we cannot enforce any such rule. I regret exceedingly that there has been an effort here to antagonize these two institutions of learning, dental and medical. But that you can make good dentists in medical schools, either as these schools are at present constituted, or as they are likely to be in the near future, looks to me entirely utopian.

REPORT OF THE COMMITTEE

ON

DENTAL LITERATURE.

By W. A. BRONSON, Chairman.

The rise and progress of dentistry in the United States has been an object of admiration to the profession for many years. Again and again has the small seed planted an hundred years ago, been compared with the wide-spreading tree of to-day; and loud and long have been the pæans of congratulations from all parts of our country.

That there is much cause for this rejoicing, cannot be, nor has it ever been, denied. The growth of an art which, scarcely a century old, numbers its present ten thousand votaries—and that despite the inherent difficulties and obstacles in the way of its successful acquirement and practice—may certainly be matter for wonder.

It is not the province of this report to explain such rapid growth, or to consider the steps by which dentistry has arrived at its present importance, numerically, and as one of the healing arts. Still, as introductory to the views hereafter advanced, it is requisite to inquire somewhat into those circumstances which form the foundation for the oft-repeated gratulatory remarks on the rise and progress of American dentistry.

Careful observation of the written and oral efforts on this subject, during many years past, will, it is thought, establish as a fact that the *results* of our professional skill have been very much more thought of and spoken about, than the occult causes which have produced those conditions which it has been our endeavor to remedy. The cure of a dental disease, the re-establishment in health of an ailing organ, or the mechanical restoration of a partially or wholly destroyed one—such are the things which have long seemed to fill the eye of dentistry, to the almost utter exclusion of other and equally important objects of study. The discovery of *causes* appears to have become subordinated to the observation of *effects;* or, in other words, practical dental art appears to have made enormous strides in advance, while theoretical dental science has, to say the least, not kept pace with that branch of professional effort by which it should have been followed, not preceded.

Such a conclusion, it may be said, is always inseparable from the first growth of any science. This is, indeed, as true as it is unavoidable; for it is only by observation of daily recurring effects that a knowledge and appreciation of their causes is to be obtained. Still, it is equally a truth in the history of general science, that the ultimate aim of the student has been, not simply to accumulate facts, but to evolve causes from effects, wherever and whenever such effects have been encountered; and thus to lay a substructure of theoretical conclusions by which to govern further observation intelligently, and explain further and new facts correctly.

The permanent literature of any science—the literature having the most lasting and powerful effect for good on that science—is the literature which treats of cause rather than effect—that which gives reasons, rather than that which describes results. Any science or art possessing a copious and deeply-studied literature of the first kind, has abundant reason for self-gratulation; since it then holds, within itself, the seeds of further healthy advancement, and possesses a foundation of truth which nothing but the grossest neglect of the principles thus inculcated can ever destroy, or even injure. Now let us ask ourselves, can such a literature be said to belong to, or to have been the fruit of, American dentistry?

The dearth of strictly scientific dental books must be deplored by all who wish scientific prosperity and value to the future of the profession; and the appearance of each of such works will be proper occasion for congratulation on the part of all dentists. Of such a character is a work which has

been published in London since the last meeting of this Association—the "Manual of Dental Anatomy, Human and Comparative," of Charles S. Tomes.

This work is intended only as a students' manual. In the words of the author's preface, "I have long been embarrassed by the want of any manual sufficiently recent to embody the advances which have been made of late years, and yet not too comprehensive in its scope, which I could recommend students to adopt as a text-book; in writing this volume my endeavor has been to supply this want." Yet, despite its humble pretensions, the book is eminently adapted to the wants of practical men in our profession. A dearth of knowledge of comparative dental anatomy, appears, among us, to be joined to (as it is the certain cause of,) a great want of appreciation of the importance to us, as scientists, of the subject. It is true, teeth may be filled, and many other dental operations successfully performed. without any very intimate knowledge of the causes of those organic disturbances which we are called upon to correct; yet any sufficient acquaintance with the origin and occult operations of disease can be attained only through deeper channels of observation and study than can be had through the most careful inspection of superficial results.

It has been said, that thoroughness in any one science can be had only through an intimate knowledge of all the others. Without going so far as this, it is certainly safe to say, that acquaintance with the anatomy of other animals than the human, is of vast importance in the study of the structural functions of the latter. Thus it is, that the work before us takes on so much of value in the estimation of the dental student.

Without attempting any extended or particular examination of this work—a labor which the committee feels, indeed, unable properly to perform—it may be noted that some parts of the book, and notably the sixth and seventh chapters, on the teeth of fishes and reptiles, are to be considered as mainly the results of original investigation and discovery on the part of the author. As such, they reflect great credit upon him, and through him upon the profession. It is true that these results of his labors in this direction may appear, to the careless eye, somewhat meagre; but he who is accustomed to scientific research is well aware that the value or importance of discoveries and deductions is not always directly proportional to their apparent extent. Any steps into the hitherto almost neglected field of investigation offered by the development of piscine and

reptilian teeth, must be regarded with interest by the intelligent observer; and we must thank the author for the enterprise and spirit of careful study displayed in thus even attempting to fill the hiatus which has hitherto existed in this direction. That the labor thus expended will be productive of excellent return cannot be doubted; even if it serves only to direct scientific attention more steadfastly to the subject.

In the remainder of the work, the author has, as he states, "freely used whatever material was available." He further adds: "Some little resemblance will be found between portions of this volume (especially Chapter V, on the development of the jaws and teeth,) and portions of my father's 'Dental Surgery,' which, in the absence at the time it was written, of any recent work on dental anatomy, contained a great deal which was more strictly related to this section of the subject; and the resemblance was the less avoidable, inasmuch as the 'Dental Surgery' was revised and added to by myself, three years ago."

Yet it must not be supposed, from this, that the book is in any respect a copy or rehash of any other dental work. On the contrary, perhaps its greatest merit lies in the fact that it embodies the principal, at least, of those "recent accessions to our knowledge which are nowhere else to be found in a collected form, but which must be sought for in the pages of various original memoirs, some of them not very accessible."

Regarded in this light the work before us is of very great value, both to the student and the practitioner of dental science; and must undoubtedly attain to importance as a text-book and manual of reference.

The profession is already familiar with the work on "Operative Dentistry" by Prof. J. Taft. This book is again presented to us this year, in the form of a third edition, thoroughly revised, and considerably enlarged. As a text-book for the student, it is undoubtedly of great value, since the minutiæ of operations are explained with care and clearness, and the theories of disease and methods pretty well stated. The objections which laid against the previous editions as works of *scientific* authority, however, hold good also as regards the last edition. The book, while presenting excellently well the *alpha* of professional acquisitions, and even something more, cannot be said to attain their *omega*. Perhaps, when the subject itself is carefully reviewed, such a result may be said to be impossible; therefore the work must be considered as having received the highest praise when it

is said that, as a text-book for the student of operative dentistry, it as yet stands alone. An appendix of twenty-five pages has been added in this edition, consisting of an extract on "Dental Caries" from "Watts' Chemical Essays;" a somewhat needlessly lengthy and minute description of Dr. Corydon Palmer's plugging instruments; a history and description of Dr. Bonwill's electro-magnetic mallet, Dr. Buckingham's engine plugger, Hyde's pneumatic mallet, and Dr. Louis Jack's matrices; and extracts from medical journals on salicylic acid. It is still stated (Page 205) that Dr. Atkinson introduced the use of the mallet to the profession, in despite of well-known proof and Dr. Atkinson's oft repeated assertions to the contrary. This is an error which there is hardly any excuse for perpetuating. While hand-filling has received, as it properly should, careful and exhaustive treatment, the methods of mallet-filling, particularly as connected with the use of the various automatic instruments now so well-known and widely employed, are hardly noticed. Certainly the general principles of filling, as illustrated, might be sufficient to guide the learner to a proper use of these instruments; but there are certain minutiæ of methods and devices which, if treated of, would have made the work more complete, and added much to its value.

This work is so widely and thoroughly known, that any exhaustive review of its contents is entirely unnecessary. We therefore pass to a consideration of the published Transactions of the various societies, which demand notice as of much and steadily increasing literary value. The production of so great an amount of serviceable material as annually appears in this form is certainly matter for felicitation. The many essays and the discussions thereon, while of exceedingly various merit, still must constitute a large amount of information, which, once freed from a great deal of extraneous, often irrelevant, and occasionally worthless, matter, would undoubtedly greatly benefit not only the student in dentistry, but the advanced and scientific practitioner. Doubtless one is often tempted, on reading lengthy papers and interminable discussions on topics long worn threadbare and never of any great importance, to desire a somewhat higher standard of subject, and a stricter censorship over publication than is evinced by much of the literature of societies. Also, it seems deplorable that so much time and ability are exhausted in our meetings on little matters of mechanical execution, or such slight changes or adaptations of operative ability as are constantly occurring in the daily practice of all our skilled men; as if the *manner* rather than the *matter* of the operation was the point of greatest import. Still, these are things inseparable from juvenes-

cence, and the youth of the profession will lead us to excuse much, while constantly teaching us to expect better things.

Much has been written and said on the subject of periodical dental literature, and many and various the opinions expressed in its regard. The extremes may be thus illustrated: on the one hand it has been asserted that the non-advance of dentistry in essentials—the tendency so widely exhibited toward skill in mechanical ability, and deftness of execution in operations—is directly and distinctly traceable to the fact that all (or, at least, the most important of) our periodicals are published by, and in the interests of, the various dental manufacturers. On the other hand, it is as confidently affirmed that to dental periodicals in the hands of dental manufacturers must be attributed almost all the advance of dentistry within the past thirty years. The first assertion is equivalent to stating that the dental manufacturer is a drag on the real progress of dentistry, while the second almost directly asserts that dentistry advances only by the aid or sufferance of that individual. It will be seen that the real difference between these disputants is not in the fact of advance or retrogression, but in the peculiar significance attached by each to the word "advancement." As is usual in such discussions, neither of the extremists is wholly correct; while it is also true that each has some grounds for his peculiar conclusions. It is undeniably a fact that mechanical appliances have grown in number and importance chiefly through their extensive advertisement in the columns of the dental journals. No individual exhibitions, no appearances before Societies, could have alone let loose upon our profession the deluge of machinery and materials under which it at present labors. It is also susceptible of demonstration that an excess of such material (formed quite as often solely for the saving of labor as for conducing to excellence of workmanship,) must inevitably tend to lower the standard of scientific attainment, although, perhaps, increasing the artistic beauty of some of our professional performances. This, it is claimed, is one of the methods by which scientific dentistry has been belittled through the exertions of our manufacturers, and forms, in fact, one of the chiefest bones of contention between those who decry the degree of D. D. S., and those who hold that of M. D. as useless to dentists. Indeed, the inelegant term of "tooth-carpenter" is somewhat too familiar to our ears.

It must be conceded that a multiplicity of instruments and materials may be so applied as to aid and further the deepest scientific research. It is, in truth, in the *manner of application* of our aids, rather than in the aids

themselves, that the true difference between the scientist and the routinist is to be found. Yet, candor and experience compel the conclusion, that an excess of tools and a glut of materials will certainly form, at least to the man of ordinary mould, a very troublesome barrier to depth of thought or profundity of abstract enquiry. Dr. Wollaston, when once asked to exhibit the laboratory whence so many of his great chemical discoveries had proceeded, and which was supposed to be very extensive and complete in apparatus, showed, to his enquirer's astonishment, a few watch-glasses and test tubes, with a very limited amount of chemicals, as the materials whence came his deductions.

Again the general character of the literary efforts to be found in our dental journals, is certainly not of the highest; and this deficiency in standard is easily discovered to proceed from the impossibility of severe censorship inseparable from such publications. A habit of writing, with facility for publishing, begets only a certain smoothness of language, and does not further depth of thought. It has been again and again laid down as an unexceptional rule by the masters of general literature, that a subject should not be written upon until it has been deeply considered and thoroughly matured in the mind. How much more strictly should this apply to printing what has been written? Yet, a temptation to get into print is sometimes powerful; and the facility offered for this by a public journal is taken advantage of, doubtless oftener than should be the case. Thus it happens that our journals, while containing much valuable material, admit also even more that is worse than useless. The effect of such lucubrations on young or untutored minds is evident and deplorable. A habit of superficiality, once contracted, is almost impossible to be thrown off, especially as regards scientific study.

Per contra to all this, it is undoubtedly true that through interchange of opinion and thought in the columns of the dental journals, and the general publicity given to much that would be otherwise of only local value, modern dentistry has made very great progress; indeed, so much, that it is difficult to determine whether the advantages thus gained do not balance all the harm which may have occurred from other circumstances. Yet this very fact is an argument in favor of better and higher-graded professional journalism; for, if so much good has been done by the present methods, despite all the harmful and even degrading influences inevitably consequent on those methods, how much more valuable will be that system of dental periodicals which shall promulgate only the good and the true, elevate

science as well as increase skill, and improve the mind while directing the fingers? Such is a system of dental journalism which must be looked for in the future, since it is certain that it has not yet appeared in the past.

There may appear in this report much more having reference to the literature of the future than to that of the present. If so, then the intention of this writing has been successfully effected. The reason is that the condition of our present literature seems to indicate, more than anything else, a necessity for reform. Such reform, to be of any permanent value, must be general, not specific. It is the whole character of our writings which needs to be changed. Things written, spoken, or printed, are worthless, or worse than worthless, unless predicated upon the sure and solid foundations of accuracy in observation and correctness of judgment. Our energies should not be frittered away upon matters of local or of only specific importance. The principles upon which we found our achievements should constitute matter for our writings, discussions and congratulations, rather than the achievements themselves. Causes should be searched for and understood, while effects should assume a secondary place. Actual scientific efficiency should rank higher than manual dexterity. The committee may be accused of criticism; but so long as the ends enumerated are unattained, criticism can never be useless.

REPORT OF THE COMMITTEE

ON

ETIOLOGY.

By D. C. HAWXHURST, Chairman.

In reporting on the subject of Etiology, I raise the question of Disuse in its Relations to Integrity of Structure in the Tissues of the Teeth.

The first result of lessened functional activity in an organ is a decline of vital resistance; then follows a downward modification of structure. What will be the result of this, if long continued? Will the effect be transmitted to descendants, and, by cumulative heredity, produce a permanent deterioration of tooth substance?

In my report on Etiology for 1876, I had occasion to make record of the fact that the jaws and teeth, their moving muscles and the facial bones in general, are smaller in civilized nations than in their savage ancestors. This question being one of simple observation on comparison of skulls, is not open to discussion. As an observed fact, it chiefly concerns us to-day as a point of departure. We may then ask what causes have been at work to produce such a result? What is their mode of action, and *what is likely to be their effect on the structural integrity of the dental tissue?*

Before answering these questions I want to say that the necessity of undertaking this inquiry, as of all studies into the predisposing causes of caries, arises from the fact that what we know of the direct agent of decay, does not enable us to account for all the phenomena. There is a missing factor, and that is to be found in the character—whether sound or defective—of the tissues that compose the teeth. Indeed the profession has of late given much attention to defects of structure in enamel and dentine, whereby these tissues possess a diminished capacity to resist the direct agents of decay. I make but the briefest enumerations of important deviations from sound structure.

The dentinal tubes that may normally pass a little way into the enamel, often abnormally expand into long cells reaching nearly to the enamel surface, rendering it porous. The enamel may be granular, or each fiber may be defective at the middle line of its axis, or, being solid, contiguous fibers may be un-united to their fellows. The enamel may be pitted and grooved, it may be honey-combed and irregular; between the cusps it may be fissured, furrowed, cracked and porous. In the dentine there may be an imperfect fusion of its calcification globules, resulting in the extremely damaging interglobular spaces. The dentinal tubules may be abnormally large, rendering it porous and liable to rapid decay.

Without attempting to ascertain how much of this defectiveness of tissue is due to a lack of phosphatic salts in food, or to other causes that may disturb dentition, it will answer the purposes of this inquiry if it shall appear that *somewhat of it is due to a lessened functional activity of the dental apparatus itself*, extending over a long period, and gradually reducing formative vitality and structural integrity. Of course, any effect that partial abolition of function can have on the teeth, must fall under the general law, that use develops and strengthens, while inaction weakens. It may be instructive to examine two or three instances wherein its action has been pushed to extremity.

It is a general truth of biology that nature pulls down and absorbs away organs whose functions have been abolished; or, in other words, that structure and function must coincide. If *disuse* is but *slightly* brought into play, the structural modification will be proportionately small; as in the common domestic duck, whose wing bones "weigh *less* and the leg bones *more* in proportion to the whole skeleton, than do the same bones in the wild duck." The fact that the domestic duck *flies less*, and *walks more*, than

its wild progenitors, is a sufficient cause of this relative difference. It is plain that a persistence of similar conditions would still further reduce the weight of wing bones, and power of flight, in the domestic duck. (See Darwin's *Origin of Species.*) In several families of wild birds the same thing has happened, and atrophy of the wings has rendered them incapable of flight. On several lonely oceanic islands, in the midst of a peaceful environment, there have been found several large ground-feeding birds that have entirely lost the power of flying. Neglect of flying has in these cases been followed by atrophy of the flying organs. (Darwin's *Origin of Species*, Page 108.) In several genera of beetles is repeated the spectacle that we have just seen in flightless birds. The entire family of *Staphalinæ* have lost the power of flying, and exhibit their flying apparatus in a more or less atrophied condition—the wings reduced to rudiments, and the wing covers consolidated. The only tenable explanation here is, that the mode of life in which these animals differ from the other members of their order and class, gradually superinduced in their flying ancestry the habit of not flying, and, at the same time, atrophy of the organs of flight.

If now it should appear that our sound toothed but savage ancestry, gradually discarded a coarse and resistent regimen for soft-cooked food, superinducing the habit of chewing more lightly, may it not be safely questioned whether we, their descendants, are not suffering from the earlier stages of dental atrophy? I do not forget that there must necessarily result a different kind of atrophy in flinty organs like the teeth, from that of parts which circulate the blood corpuscle, and that in many ways the action would be different. Some of the differences, I hope, will appear later.

It is at once apparent that there can be no atrophy of a hard structure that suffers no interstitial change. The results will therefore be due to changes in the soft parts in connection, and a consequent effect on progeny. In the above cases we have seen an essential organ of the animal body rendered functionless by disuse, and reduced to a rudimentary state. I now present you a case in which an organ, quite as important as the wing, has been so completely atrophied from disuse that not even a rudiment is left. This has occurred in a genus of lizards, the *Anguis fragilis*. This quadruped, which once made its way by means of four well-developed legs, has suffered their entire loss through having gradually adopted a changed mode of locomotion. This change of habit, no doubt, grew out of some slow modification of its food-procuring habits, whereby its mode of progression came not to be effected by exercise of the legs. Through this agency, the

stimulus of use was gradually withdrawn from the limbs; they dwindled to the condition of useless appendages, and were after a time abolished by atrophy. (See *Descent and Darwinism*—Schmidt, Page 185.)

Two other genera of lizards exhibit these animals in a state of transition. In the *Chirotes*, the hind legs are abolished, while the fore legs remain. In the *Pseudopus*, the fore legs have been entirely suppressed, and the hind legs exist but as useless rudiments. That these animals once had four legs, has been proved by Furbringer from an examination of the pelvic arches and sternum, and from the history of their development. It will be at once recognized that an organ so important as the leg, must have been long in undergoing complete abolition. Perhaps many thousands of generations of cumulative hereditary atrophy were required; although it must be acknowledged that soft parts like muscles and nerves, and comparatively soft parts, like bone, which freely circulate blood, will dwindle from disuse faster than the dense structures of the teeth.

Without multiplying illustrations needlessly, I may say that a large number of cave animals and insects, both in this country and in Europe, have suffered atrophy of the eyes from disuse. In one, the crab, the eye-stalk remains to tell the story, though the lenses have been absorbed. In every class of animals are the remains of organs that were once fitted for vigorous actions. Not one of the higher animals but exhibits rudiments of organs that were needed to adapt it to a different order of things in a remote age. (See Darwin's *Origin of Species* on the Atrophy of Organs.)

In the cases already given, the atrophy and abortion of organs has taken place in parts which circulate blood freely, and which are therefore speedily sensitive to any change in the force and rapidity of the vital currents. The shrinkage and atrophy of these parts, with final abortion, is unattended by such impairment of structure as to cause the organ to crumble, dissolve, or exhibit a solution of continuity. The effect of disuse is, however, very different on the denser tissues, such as the horny structures of insects, and the teeth of animals. Disuse of these structures is not followed by immediate shrinkage, but rather by slow decrease, in the succession of generations, and impairment of developmental processes, resulting in a state of frailty or tissual infirmity, which is proportionate to the atrophy. Such hard structures, when so atrophied, if subjected to force, easily give way, and if to the

disintegrating action of chemical agents, are more quickly broken down than perfectly developed tissues. But this will not be true of atrophied soft parts. Soft tissue while undergoing interstitial change, hugs close to the ebbing vital currents, shrinking down to dimensions small enough to keep its substance good.

To illustrate this principle, I make brief reference to certain beetles, of which there are several genera that exhibit atrophied hard structures, with defectiveness of tissue. In the males, the horny anterior tarsi, or feet, exist in a rudimentary state. These feet appear to be of little use to the beetle, and almost invariably fall off entirely at an early age, their absence appearing to cause the animal little inconvenience. The *Onites apelles* has been thought to be entirely without these anterior feet, but further investigation has shown that they exist in the young, though they crumble away with advancing age. Thus it seems that these *tarsi* cannot be of much importance, or be much used by the beetle, and that they are in process of abortion. (See Darwin's *Origin of Species.*) In an allied genus, the *Ateuchus*, their entire abolition has taken place, and it is born with its two front legs footless, which is of little consequence, since it has four strong feet left. The point of interest in these beetles is the mutilation which almost invariably occurs in the rudimentary hard tissues of the *tarsi*, furnishing an illustration of the principle, that while soft parts may respond to abolished function by dwindling to smaller dimensions, non-vascular parts make their first response by deterioration of structure.

An interesting instance of the disappearance of an organ made of dense tissue is found in a marine crustaceon, the Cirripede. (Darwin's *Origin of Species*, Page 136.) This animal has a shell which consists of the three anterior segments of the head enormously developed, and supplied with nerves and heavy muscles for opening and closing. These calcareous plates are reduced gradually to a slight rudiment, when the animal comes not to need such protection. This happens when the cirripede becomes parasitic, and borrows protection from the shell of a neighbor. One genus, the *Protelepas*, thus loses almost completely its calcareous shell, and also the great muscles that close it. (See Spencer's *Biology*, Vol. I, Page 184.) I have been unable to learn as a matter of fact whether the carapace or shell of this parasitic cirripede conforms to the law, that dense structures, in becoming rudimentary, exhibit defective tissue. This is, however, almost certain to be the case on *a priori* grounds.

Coming now to rudimentary teeth, the tusk of a species of elephant in Ceylon deserves especial study. The organ has not only become rudimentary, but has been entirely suppressed in the large majority of the animals. The few that possess them, however, are invariably males, in whom they are reduced and imperfect. (See T. Emmerson Tennent's *Ceylon*, 1859, Vol. II, Page 274, or Darwin's *Descent of Man.*) There is also an antelope *Antelope montana*, in which the canine teeth exist only as rudiments in the young male, and disappear in the adult state. They are infirm, and of little use. They are absent in the female at all ages; but the females of certain other antelopes have been known to occasionally exhibit rudiments of these teeth. To show how the rudimentary condition of this tooth is related to its disuse, it should be remembered that in ruminant animals "the development of the horns generally stands in an inverse ratio to that of the canine teeth." (See Darwin's *Descent of Man*, Vol. II, Page 246.) The cause of this is plain. Since a ruminant animal does not generally use the canines for any purpose but fighting, the development of horns would render this tooth useless, and it would dwindle through disuse (as has happened in many animals), or might never come into existence if the horns were developed first. The rule has some exceptions. But a withdrawal of the *stimulus of use* has not only permitted the teeth to fall backwards in size and function to the position of rudimentary organs; it has gone further. In a few instances it has resulted in the gradual but complete disappearance of the dental apparatus by atrophy. It might have been convenient to present this class of cases first of all, but it was necessary to consider organs in their various stages of progress towards extinction in order to show their defects of structure.

The active suppression of the teeth in at least two members of the vertebrata has been pointed out by Mr. Darwin, who instances certain whales that have not a tooth in their jaws in maturity, but exhibit teeth in their fœtal condition. In this case, as Mr. Darwin has shown, not even temporary functions can be assigned for these organs, which are first built up and then pulled down again. (See Spencer's *Biology*, Chapter V, Page 364.) They are absolutely without any function, and are absorbed away before the animal is born into the world, where it might have used them. It is obvious that this trace of a dental system must have descended from some ancestral progenitor supplied with teeth. Disuse and the continued transmission of acquired and inherited weakness had, after perhaps countless generations, rendered the whale edentulous. Analagous to the above is the discovery of rudiments of teeth in the beaks of the embryos of certain birds. Bearing

in mind the fact that the embryo passes in its development, through a series of states representing more or less distinctly the condition of its ancestors, we must conclude that these birds were descended from ancestral forms having tooth-bearing jaws, and that the long persistence of conditions unfavorable to the development and nutrition of the teeth has resulted in their suppression. (See Von Baer on Embryology.) It would be interesting, were there time, to study the teeth of whales still further. In many of them, rudimentary teeth exist after birth, but are lost in adult life. In others they persist in a stunted and ineffective condition to adulthood. In some species, certain members of the dental series have been dropped, as man is now losing the wisdom teeth. (See Tomes' *Dental Anatomy*, Page 287.)

Whether the human teeth have already felt the influence of beginning atrophy, is a question of great importance, and one that lies at the very foundation of the researches undertaken in this paper. The fact that they are not holding their own, but, like the jaws, are gradually losing in size and weight with the advance of civilization, must indicate that they are already in those earlier stages of decline that precede and lead to the rudimentary state. As confirmatory of this, it may be noted that they are already beginning to exhibit those defects of tissue that characterize the rudimentary state of hard organs, as well as that occasional eruption late in life, or at times non-eruption, which in the lower animals has been found to be the harbinger of final suppression. Different members of the dental series in man are differently acted upon. I made a report to this Association last year on the modifications of the wisdom tooth. A similar study remains to be made on each member of the series. It appears that several are failing more rapidly than the remainder, which is due to the varying stimulus of use, on account of difference of position in the dental series

It remains for us now to consider the special forces that have acted for an extended period upon the teeth of mankind. That savage nations feed differently from the more cultivated, is plain; and that the food of tribes in a savage or semi-civilized state, demands a relatively larger amount of mastication, all writers and travelers have agreed upon. To what extent alternations of pressure and hard usage, calling the blood to the parts, has been abolished by modern cookery, I cannot decide. But I know that we have little now to do in mastication but to move the jaws. The teeth are seldom firmly pressed into their sockets and made to feel the reactive stress of their proper functional activity. Thus, neither the jaws nor teeth are as abundantly

supplied with blood and nutritive pabulum in civilized, as in savage races. A decline in development must be the sure result.

This change of habit must have gradually produced physiological and structural decline in the individual. It is the province of heredity to transmit these to descendants, and to add to them so long as their cause remains in action; for heredity tends to transmit to descendants the whole nature of their progenitors; not only their points of strength, but also their weaknesses; not only sound tissues, but also those which are the subject of deterioration. "The blind fatality of its laws regulates not alone progress, but also decay." (See *Heredity*, by Th. Ribot.)

It thus appears that the inherited defects of countless generations slumber in the teeth of the Anglo-saxon, ready to be developed by favoring conditions. His fast decaying teeth carry in their tissues a record of the gradually induced atrophy of a long line of progenitors, reaching backward into the pre-historic ages, when the first fire was built, and cookery began. The present state of these organs is the result of innumerable modifications of tissue in the direction of defect, slowly accumulated as the generations passed on, and added to by improvements in the art of cookery and the invention of new luxuries.

I would not be oblivious to the existence of direct agents of decay, nor the constitutional causes that act in special cases. I seek only to make record of a cause which has been able, I fear, to introduce gradually into an originally impregnable tooth-structure, a source of widespread structural infirmity that is able to render the direct agents of decay far more injurious.

REPORT ON ETIOLOGY.

By MARSHALL H. WEBB, of the Committee.

When pabulum of the proper quantity and quality is normally appropriated by the cells, they construct perfect tissues. Regular aggregation of atoms, and perfect molecular and granular arrangement, (which manifestation is but the assertion of the typal presence resident within and about each cell, and aggregation of cells), not only brings about normal development of tissues, but of organs also, and these, embodied, constitute a system. Anything that interferes with the richness, or the due supply, or perfect appropriation, of pabulum, induces the cells to construct abnormal tissue or deformed organs—to produce abnormality or deformity in parts of a system—therefore, due supply, exact distribution, and perfect appropriation of nutritive plasma constitutes the domain of science which is known as physiology. Any deviation from the normal process is called a *pathological* manifestation. Such manifestation implies disease, and all that department of science which relates to the cause or causes of diseased action is known as *Etiology*.

The etiological department of scientific investigation has not become exact enough for the clear detection of all that which interferes with nutrition and excites diseased action, yet reference may be made to effects which seem to be, directly or indirectly, the sequence of certain causes. From the time of the segmentation of the blastoderm (segmenting body—protoplasm,) of the fecundated ovum, on through embryonal existence, infancy, childhood, youth and manhood, to old age, remote and proximate causes of

disease may manifest themselves, and death ensue. There are many remote causes of disease, and they may be connected with almost every element of the system.

The demand of the system of the *enciente* for the phosphates and the other necessary elements is not always fully supplied, or the mother's system may not have been in the proper condition, during the embryonic and infantile existence of the child, to assimilate the nutritious particles, even were they furnished in full proportion, and this may lead to a manifestation of disease which would not otherwise have been developed. From the time the fœtal system enters upon its individual existence, to the time when inhalation, and systemic, organic, tissual, cellular, granular, and molecular life ceases—to the time when what we call *death* ensues, and the soul takes its flight—there is danger of disease and death from infraction of the nutrient law. The inhalation of air charged with parasites and particles of disintegrating animal and vegetable tissue, the drinking of water containing such matter, and such of the lower forms of life as act injuriously upon the system, and the taking of improper, or imperfectly, or too *thoroughly* prepared food, all these may act as factors in the production of disease.

As disturbance of function during the development of the child *in utero* may lead to, and is very often manifested in, imperfect organic development, so, also, are the factors of function—the cells—so interfered with through systemic disease during infancy and childhood that the building up of tissue is retarded, and when the organ is developed there may be seen a line between the unarrested and arrested tissual development. Such is often clearly seen in enamel where arrested nutrition, and consequently arrested development, is recorded in distinct and indelible characters. The etiology of this abnormal development of enamel tissue is traceable to an arrest of nutrient activity at the time when the cusps of the first permanent molar and incisor teeth, and sometimes when the bicuspid and cuspid teeth, are being formed. The diseases which cause such suspension of nutrient action are the exanthemata, scarlatina, measles, and even less marked systemic disease; these lead to a disturbance of the activity in and supply of pabulum to the cells, and thus imperfect tissual and organic development may follow. Imperfect development of tissues and organs may take place and not be made manifest during the development of the system, nor subsequently, unless diseased action ensues. Then the imperfect structure may be attacked and may thus lead to the injury or death of the entire body. Abnormal tissues and rudimentary organs may also lie dormant throughout life and not be known

of or suspected. For instance, more or less imperfectly developed dental tissues encased in what is known as "dentigerous cysts," and the rudimentary organ, *appendix vermiformis*, may remain inactive—encysted or suspended—during the whole of life, yet the one has been transformed from a benign and led to a malignant tumor, and had to be removed, while the other has become diseased through an accumulation of seeds, calculus, and other matter within it, and soon led to the death of the patient.

Out of the protoplasm of the fecundated ovum, and through lack of quantity and quality and proper appropriation of the pabulum furnished to the cells, while the system is developing and has been developed, imperfect tissues and organs appear, changing the form, not only of the system, but of the organs themselves. Even enamel tissue may not only have been imperfectly developed, but the form of the whole organ, particularly the crown of the tooth, may have been modified. Just at the time when the enamel is not fully calcified and fixed in form, the system may be seized by a spasm, and through this the coronal part of the organ may be so changed as to appear as one of those known as the "Hutchinson Teeth." Dr. C. N. Peirce, of Philadelphia, cited an instance of this in an essay upon "The Development of the Teeth as recognized by the Authorities of To-day," read at the meeting of the Pennsylvania State Dental Society in July of this year. It would be well, therefore, for all diagnosticians to consider this before attributing the cause of such mal-formed organs to syphilitic taint. In addition to the similarity of form between the teeth developed under the influence of the syphilitic or other forms of spasmodic disease, Dr. Peirce remarked that when such teeth as he referred to are erupted, there are sometimes notches upon the cutting edge which are afterwards broken or worn off, thus indicating that there must have also been other systemic disease at the time the enamel was in its first stages of calcification. He advised all to consider this matter carefully, and not to refer the cause of such modified organic form to syphilitic influence, when it may possibly be traced to another disease.

Throughout the animal and vegetable kingdoms each and every form of life conforms to what is known as a type. There may, however, be minor modifications of type. Retrograde metamorphosis may also take place, and this has been noticed at times, especially in the human species. Disease, or imperfect or arrested development because of disease, may not only lead to such metamorphosis, but all this may be transmitted to the issues from a species through hereditary influences. The typal presence resident within the impregnated ovum may so manifest itself as to show the outline, in almost

every particular, of the parent type; the features may have nearly the same appearance, the tissues present the same fullness or character of outline, and the organs a similar regular and irregular arrangement. This is often markedly the case with dental tissues. The proximate causes of disease consist in the modification of the presentment of the modes of life.

Dr. W. H. Atkinson in a paper upon "Necrosis and Caries," published in the February number of the *Dental Cosmos* for 1876, states that "Health depends upon the free circulation of pabulum in the various tissues of the body," and upon its proper "appropriation by the diastole and systole of the cell-territories." "Nutrition—nourishment—consists in a harmonious concurrence of supply and departure, a coming and going of mass and energy." If this process "be rythmical and regular, we have *health.* If the afflux exceed the efflux," or *vice versa*, then we have "*hypertrophy* or *atrophy*, and these are the only doors of entrance for disturbance of tensional harmony in the currents of nutrition—which is *disease.*" Extremes of heat and cold, therefore, which accelerate or retard functional activity—interfere with the neural and vascular circulation—may thus act as a proximate or direct cause of disease, may be that which immediately precedes or produces an effect. This effect may be a want of *ease* in the part or parts, and it is, therefore, a *disease.* This condition may be followed by a still more marked manifestation of disease, and especially if a remote cause asserts itself.

In the enamel, which has about ninety-eight per cent. of mineral constituents, extremes of heat and cold may have no other immediate effect than to produce minute fractures, although capillary and endosmotic and osmotic action is also interfered with. When some remote cause favors it, and some such proximate cause interferes with the due supply and perfect appropriation of nutritive plasma, necrosis may follow; in a word, and in the language of Dr. Atkinson, "*Necrosis results from privation of pabulum.*" Dr. Atkinson further states that "All forms of death of the structures of the body are examples of true necrosis. Hence the analogue of *ulcer* in the soft parts is *caries* in the hard; that of *abscess* in the soft parts is *necrosis* in the bones." "Each change of place of pabulum involves the mechanical, chemical, and dynamical concomitant changes, the due equation of which constitutes health, and the deficiency of either, disease."

The proximate cause of disintegration of enamel and dentine seems to be due, almost, if not entirely, to acids, both mineral and vegetable; at least through chemical action both these tissues, the enamel and dentine,

may eventually be destroyed if the disintegration of enamel be not checked, and carious dentine be removed, and the cavity in which such action took place be closed.

If, says Prof. Kuss, "we examine the *acts* of which the living being is the theatre, we meet with a great number of physical and chemical phenomena resembling in every respect those produced in inanimate nature." This being the view of an acknowledged expert, we feel justified in saying that in the mineral inorganic kingdom we notice that when a depolarization of currents occurs, there is a marked manifestation of electrity. This mysterious force may, under certain circumstances, rend portions of matter asunder, and again seem to be the power which has most to do with the regular arrangement of crystals in the mineral, and perhaps cells in the vegetable, and globules in the animal kingdom.

The constituent elements of the globules or cells which build up animal tissue, are water, albumen, and fat, and mineral substances, "Such as potassium (in a state of potash salts,) and phosphates; these two substances are especially found in the nerve elements; also sulphur incorporated with albumen or represented by its salts. The same may be said of sodium, calcium, iron, magnesium, and even some other metals." It seems quite evident that it is to the multiplicity of these elements that the globules or cells owe their electro-motor power. Prof. Kuss remarks that "this property of disengaging electricity is especially met with in the nerves or nerve tubes, which are not globules but derive their properties from and are in intimate association with these globules." Thus we may see that there are phenomena which cannot well be explained, either by chemistry or physics, yet as chemistry advances to a more perfect state, and biology —"the different phases of life,"—is better understood, then may physiology be found to be the highest and most perfect manifestation of organic chemistry. Then, too, may we be the better prepared to search out and comprehend the remote as well as the proximate causes of disease and death, which causes can only be fully ascertained when pathology becomes an exact department of science.

In relation to this last reference, as to several other references to physiology, biology, chemistry, pathology and etiology, I will only further say, in the language of Prof. Tyndal, that "Here, however, I touch a theme too great for me to handle, but which will assuredly be handled by the loftiest minds when you and I, like streaks of morning cloud, shall have melted into the infinite azure of the past."

REPORT OF THE COMMITTEE

ON

INSTRUMENTS AND APPLIANCES.

The committee on appliances in submitting their report take pleasure in stating that the past year has been scarcely less productive of new and improved instruments and materials than any that has preceded it, and although nothing especially noteworthy to the degree of the Burring Engine or the Rubber Dam has been brought forward, yet it is evident that the mental activity which has characterized the period, in the domain of Physiology, Pathology, and Therapeutics has been equaled and supplemented by the inventive talent of our profession, and we are sure that not a little has been done by these means towards rendering our work less exhaustive, both to ourselves and our patients, as well as greatly enhancing the permanence and value of the operations themselves.

Like our predecessors of last year, we have to complain that the suggestion made to inventors that they should send their productions to the committee in advance of the meeting of this body that they might be more carefully examined and described, has not been acted upon, and consequently the Association must take up and be satisfied with a very hasty and imperfect description of the appliances brought to our notice.

Among the more striking articles shown is a new Operating Chair, the invention of Dr. B. M. Wilkerson, of Baltimore. It is quite unique in its construction, and attractive in appearance. Not proposing to go into a detailed description of this chair, we would note a few of its distinctive features. All the movements of the body and footstool are made very easily by the foot of the operator, not requiring the use of the hands. The movements are, moreover, made with little noise or jarring, and with great rapidity. A very desirable feature is an adjustable back, which forms, when required, a very perfect child's chair. This feature strikes us as most excellent. On the whole we desire to commend the invention, and congratulate the profession that such an excellent addition has been made to the many elegant and convenient chairs already in use.

While speaking of these articles we cannot fail to notice very favorably the S. S. White chair, which has been improved in some particulars during the past year, and made thereby still more worthy of the favorable notice which it then received.

In this connection we may mention Lyon's Operating Stool, which now is shown with an improved lock-brake, permitting the standard to be more readily and securely adjusted to the position of the operator. A spring bolt has been substituted for the set screw, and the edge of the top better padded for the protection of the thighs. This reminds us to suggest to the manufacturers of dental chairs, as well as stools, that the comfort and usefulness of such articles would be increased by a more generous style of upholstery. Nearly all the chairs and head-rests, as now made, are "too bony."

The Electro-Magnetic Mallet of Dr. W. G. A. Bonwill (to whom is due much of the credit of having introduced and perfected this instrument,) is shown us, having been modified and improved in several particulars since the last report. It has now been reduced to the smallest number of working parts, and the pieces are in the simplest form, so that any one can duplicate them if necessary. The whole has been so consolidated as to take up the least space in the hand, and so balanced as to rest pleasantly and securely therein. The blow, or impact, has been increased fully one-half, without increasing the size of the magnets or changing their simplicity. A still further improvement permits the use of plugger-points with either long or short handles. These and some minor changes have in the opinion of the inventor brought this valuable instrument nearly to perfection, and should secure for Dr. Bonwill the well-merited honors to which he is fairly entitled.

A new method of mounting teeth, or rather, a new style of plate-work, was shown by Dr. Geo. F. Reese, of Brooklyn. The plate is cast very much in the manner of Cheoplastic work, but an ingenious flask is used, which simplifies the work very considerably. The material of the plate is an alloy of tin, seeming to possess great strength, and of good color, which, it is claimed, is retained during wear. We see no reason to suppose that such plates would be in any respect inimical to health, and think that the style of work may, in many cases, prove very desirable.

An Automatic Engine-Mallet, the invention of Dr. G. W. LeVin, of Chicago, was shown by Dr. Swain, adjustable to any angle, from direct front, to direct back action, and in size easy to handle. It has been used successfully by several practitioners, and seems well adapted for its work.

S. S. White exhibits:

A Brake for the immediate stopping of the Burring Engine, and an improved Collar-lock for the hand piece.

Some gutta-percha in pellets, which are very convenient for use, and improved in quality, being tougher and less sticky than those formerly supplied.

Weston's Platinum Cavity-caps, for carrying plastic coverings for exposed pulps. The edges are turned, and a hole in the center serves for the escape of surplus material, and offers a convenient means of handling.

A Folding Engine-tool-rack, the invention of Dr. W. A. Stevens, is a very ingenious affair, admirably adapted to the purpose.

A closed Spittoon-Bracket, invented by L. T. Foss, which opens to receive the spittoon, then locking around it, thus rendering accidental displacement of the spittoon impossible. There is also a stop-pin by which the horizontal swinging may be prevented. This seemed to be a most perfect appliance.

A Gas-Cylinder with improved plug-valve. Also a mouth-piece with improved valve, in which the simple turning of a handle admits air to the patient, or the reverse admits gas, and also shuts off the gas more completely than the old style; they are both attached to a very neat apparatus for gas.

One of the most useful articles shown by S. S. White is Dr. Farrar's Alveolar Abscess Syringe. This can be used either as an ordinary, or a drop

syringe, and is supplied with several forms of nozzle, by the use of which the treatment of abscesses is rendered much more satisfactory and successful than by the means ordinarily employed.

Johnston Brothers brought to our notice, in addition to the Wilkerson Chair, several lesser improvements, among which were a device in the Elliott Suspension Engine for keeping the driving wheel off center when at rest, and at the same time making the motion of the treadle easier. A very desirable change has also been made in the hand-piece, whereby the wear consequent upon use is compensated for in such a way as to secure entire steadiness of motion to the tool. They also show a new valve for confining liquid gas, constructed on a principle which would seem to overcome the difficulty which has heretofore attended the use of gas confined under great pressure, namely, that of rusting and consequent wear.

A very complete set of Clamps, to facilitate the use of the Rubber Dam, devised by Dr. Delos Palmer, of New York, was also shown. These have been carefully elaborated, and the set consists of quite a number, each one perfectly adapted to its typical tooth, and arranged in a case so as to be convenient for use.

Dr. W. S. Elliott's Articulator has also been slightly improved, so that the model can now be attached instantly without the use of plaster.

Dr. W. N. Morrison's instruments for making and using retaining screws are also improved.

A little Saw-and File-Carrier, the invention of Dr. Clapp, will be found very useful.

In *materials for filling teeth* not much that is new or improved has been seen. Allusion has already been made to White's improved form and quality of gutta-percha. He also showed us cylinders of combined gold and platinum, gold and tin, and platinum and tin. What the advantage of such combinations may be, we do not profess to know, nor do we deny that they may be considerable; experiment alone can determine.

R. S. Williams has given as a new preparation of gold foil, containing a slight alloy of tin or cadmium, giving to the foil extreme softness. We have reason to think the article will be much liked. A very convenient

foil tray and case, devised by Dr. Gaylord, is made by Mr. Williams. A glass cover keeps out dust and permits a view of the contents of the case.

Standard Tin Foil also shown by Mr. Williams is said to be prepared somewhat differently from the usual way, and seemed to be very tough and pliable.

Dr. E. R. Mullett, of Clinton, Iowa, offers an Automatic Mallet, which possesses the advantage of being lighter than ordinary, and very compact.

A "*Stop-Motion Hand-Piece*," exhibited by Dr. E. Osmond, of Cincinnati, is adaptable to any style of engine, and seems to be entirely new in principle and application. The revolution of the burr is immediately stopped by the index finger, while the engine continues running.

A "*Parallel-Motion Bracket*," exhibited by the Buffalo Manufacturing Co., is adjustable at any point within its range, and held in position by friction, without change of screws or stops.

Dr. S. A. Watling exhibited an improved Lower Molar Forceps, by which he claimed the force in extracting is exerted by the shoulder instead of the wrist, at the same time giving the operator a more perfect view of the tooth upon which he is operating.

Dr. S. Babcock, of Springfield, Illinois, exhibited a "Diamond Disk," composed of diamond dust imbedded in copper, as a substitute for the ordinary corundum-wheel; also, platinum strips charged with diamond dust for finishing proximal fillings. Both seem well adapted for their work.

Dr. J. W. Greene, of Chillicothe, Missouri, showed a simple and effectual device in the nature of a double cylinder, whereby a common chair can be readily converted into an operating chair. He also presents *Mills' Turbine Motor*, small and compact for running the Dental Engine. It is made in larger sizes, suitable for the lathe and heavier work.

Tuerk's Hydraulic Dental Burring Engine strikes us as being of great merit, inasmuch as it is simple, powerful, economical in the use of water, and so small and light as to be handled with great facility. Its movement is easily controlled, and the speed can be increased or diminished at will.

Desiring to bespeak the indulgent criticism of this Association, as well as that of the parties mentioned in the above, for the necessarily incomplete manner in which we have performed our task, this report is respectfully submitted.

ALBERT H. BROCKWAY, } Committee.
THOMAS FILLEBROWN, }

REPORT OF THE COMMITTEE

ON

PRIZE ESSAYS.

Your committee would report that they have had given them for investigation, one essay, which they have carefully read. They are of the opinion that this essay does not come within the scope of the intention of the Association in establishing prizes. The Constitution (Art. VI, Sec. 5,) reads: "Two prizes of medals, not exceeding in value fifty dollars each, may be awarded to the best two communications reported on favorably by the Committee on Prize Essays, directed by the Association to be published." This is all the directions the committee have to guide them. They are of the opinion that the essay in question is not of sufficient general interest to the profession at large to authorize the Association to grant its author a medal, or to go to the expense of publishing it. They would therefore recommend that it be returned to the author.

W. H. MORGAN, }
L. D. SHEPARD, } Committee.

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